THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVII. No. 679.] LONDON, MAY 16, 1876. [28TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED GARESFIELD COKE.
RAMSAY'S ORDINARY GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.
London, at the Lombard Exchange, 39, LOMBARD ST., E.C.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

THOMAS PROUD,
MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS
AND
PURIFIERS.
BROOKFIELD IRON-WORKS,
103, ICKNIELD STREET EAST,
BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.
JOS. COWEN & CO. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
69, UPPER THAMES STREET;
COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE,
} LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
Lists may be obtained on application to
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JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
ESTABLISHED 1850.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM.
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
LONDON AGENT—W. G. DAVIS, 2, Brabant Court, Philpot Lane, E.C.

J. & H. ROBUS,
CONTRACTORS
FOR THE
ERECTION OF NEW & REMODELLING OF EXISTING GAS-WORKS.
RETORT-SETTING A SPÉCIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, LONDON, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

GEORGE GLOVER & CO.
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
FOR THE ENGLISH GOVERNMENT
AND FOR THE GOVERNMENT OF THE NETHERLANDS
AND OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government,
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS
Warranted to Measure correctly & not to vary.
PARIS 1867. LONDON 1862. CLASS 10. MANCHESTER 1875. SILVER MEDAL
VIENNA 1873. LONDON 1862. CLASS 10. AMSTERDAM 1869. DIPLOME D'HONNEUR
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.
236, GEORGE STREET, GLASGOW, & 30, LANCASTER AVENUE, MANCHESTER.

FOREIGN AGENTS.
DAHL BROTHERS, COPENHAGEN. | W. HOVEN & SON, ROTTERDAM.
A. FAAS & Co. FRANKFORT O/M. | COPLAND & McLAREN, MONTREAL.
A. DEMPSTER, POST OFFICE PLACE, MELBOURNE.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

WAREHOUSES:

LONDON: 157, UPPER THAMES STREET, E.C.

LIVERPOOL: No. 63, Paradise Street.
MANCHESTER: No. 7, Blackfriars Street, Salford.
PARIS: No. 38, Rue du Chateau d'Eau.
LILLE: No. 38, Rue Grande Chaussee.

1862.

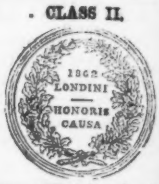
PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.



This Paint having been in general use over fourteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

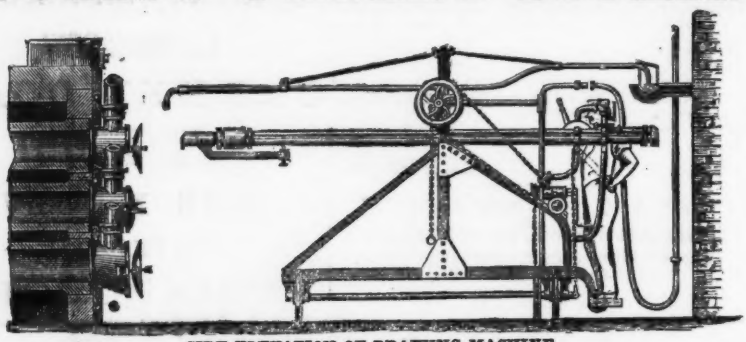
It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

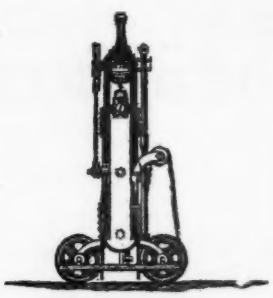
N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

(*The Charging Machine will be Illustrated in next week's Advertisement.*)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz; Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;
LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;
HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;
GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

THE LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY GAS-METERS, GOVERNORS, PRESSURE & EXHAUST REGISTERS,

&c., &c.

STREET-LAMP METERS in CAST-IRON CASES.

LAMP COCKS AND BRASS FINISHING IN ALL ITS BRANCHES.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully,

MAGNUS OHREN.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.

No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,

Has all the appearance of a Bright Fire.

PRICE from 32s.

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

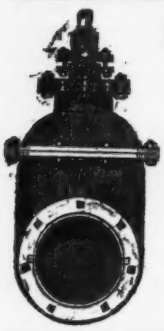
The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.

These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

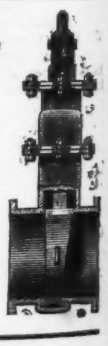
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

WILLIAM SUGG,

GAS ENGINEER,

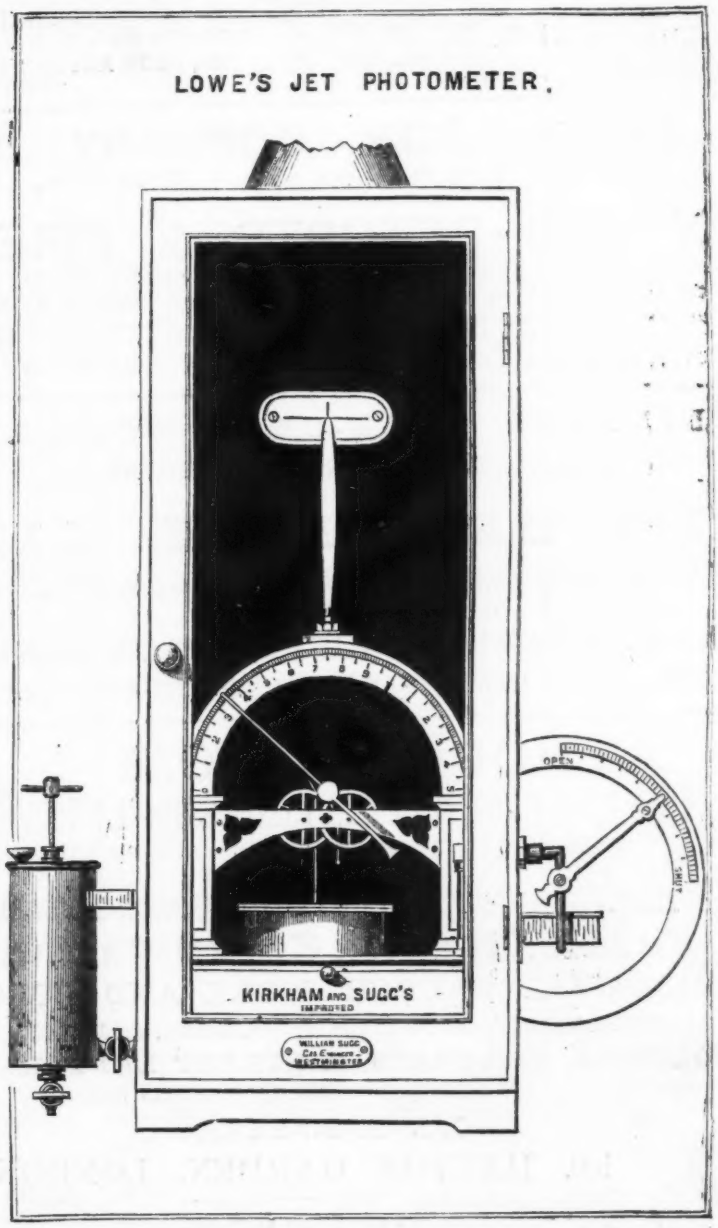
VINCENT WORKS, VINCENT STREET,

WESTMINSTER, S.W.

"EVANS"

Photometers,

which do not require a Dark Room, with every Fitting accurately made to Gauge, French Polished Bench and Drawers complete, as approved by the Gas Referees.



"LETHEBY"

Photometers,

with Fittings and Bench complete for Dark Room, as approved by the Gas Referees.

LOWE'S JET PHOTOMETER

(KIRKHAM AND SUGG'S IMPROVEMENTS),

With new external Water-Line Regulator; Improved Micrometer, with Quadrant divided into 45 degrees; Valve, with *pro ratâ* opening; Improved Ventilator, Purple Glass Height of Flame Measurer; King's Gauge, working on Friction Rollers. In French Polished Pine Case. Diagram for ditto for finding the Illuminating Power in Candles.

PRICE £12 10s. COMPLETE.

Can also be had with additional Scale on Pressure Gauge, to show by inspection the Illuminating Power in Sperm Candles, at a slight extra cost.

NOTE.—When an order is given for a Jet Photometer with this latter addition, it will be necessary to state about the quality of Gas for which it will be used. The range in candles will not be more than three or four.

PRICE LISTS WILL BE FORWARDED POST FREE ON APPLICATION.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

PATENT FUEL AND LIME FOR PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

TRADE MARK. **J. BEALE'S PATENT GAS EXHAUSTER.**

BEALE'S CONTINUOUSLY ACTING

GAS EXHAUSTERS

ARE NOW MANUFACTURED BY

B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.

B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

Estimates and Prices on application to

B. DONKIN & CO.,
ENGINEERS & IRONFOUNDERS,
55a, BLUE ANCHOR ROAD, BERMONDSEY,
LONDON, S.E.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

The F. I. Co. have the exclusive right to make and sell Fraser's Patent "Ribbed" Gas-Retorts in Fire-Clay.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

Apply as above, or to the London Offices, 15, NEW BROAD STREET, E.C.

LIVESEY FIRE-CLAY WORKS.

NEAR BLACKBURN, LANCASHIRE.

(ESTABLISHED 1835.)

ORLANDO BROTHERS, LIMITED,

MANUFACTURERS OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

GAS PURIFICATION & CHEMICAL CO., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL,
SAMUEL H. JOHNSON, } Joint Managing Directors.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

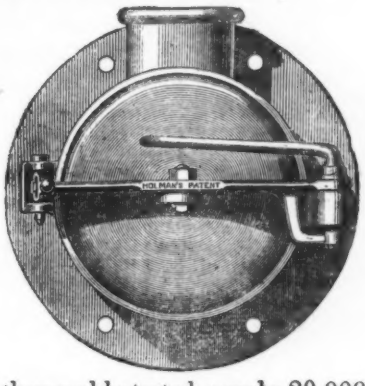
SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS,

Anti-Friction Catches and Eccentric Fastenings.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required. Holman's New Self-Sustaining Cross-Bar ensures freedom of joint and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, nearly 20,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton, where nearly 4000 are in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

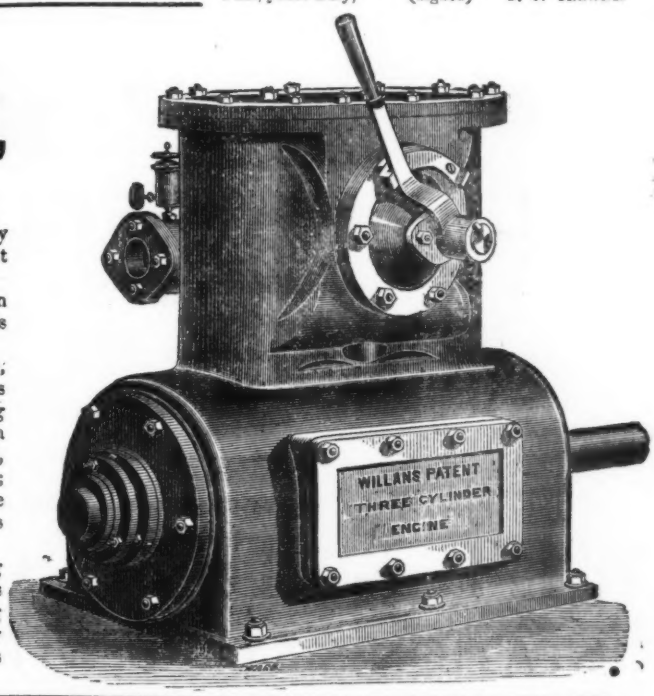
I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly, (Signed) G. C. TREWBY.

WILLAN'S PATENT THREE-CYLINDER ENGINE,

ESPECIALLY SUITED TO DRIVE

GAS-EXHAUSTERS.



This Engine is exceedingly simple in construction, unlikely to get out of order, and can be safely driven by the most unskilful.

All the working parts are enclosed in a strong cast-iron casing, so that nothing is to be seen in motion except the ends of the shaft projecting from the sides of the casing.

The Engine consists of three cylinders cast in one piece, parallel to each other. From the bottom end of the cylinders a chamber extends downwards, enveloping the connecting rods and crank-shaft. Upon the side of the cylinders is a valve and lever by which the Engine may be started, stopped, or reversed. The pistons receive steam only on the top side; but, as there are three of them, there is no dead centre. The Engine will stop and start in any position, and no fly-wheel is necessary.

The reversing valve is not attached to any of the working parts, and the Engine may, for this reason, be reversed as easily at full speed as when running slowly. As the working parts are all balanced, the Engine is capable of running at very high speeds, without vibration, and consequently it requires the smallest amount of foundation to fix it.

INDICATED HORSE POWER—At a mean steam pressure of 30 lb. per square inch.	2½ H.P.	4½ H.P.	13 H.P.	16 H.P.	31 H.P.	53 H.P.
Diameter of Cylinder . . . . . inches.	3	4	6	7	8	10
Length from end to end of shaft-bearings . . . . . "	18	25	36	47	49	60
Breadth . . . . . "	12	15	20	22	27	34
Height . . . . . "	19	20	29	40	42	56
Weight of Engine complete. . . . . cwt.	2½	3½	8	9	16¼	31
Diameter of steam-pipe . . . . . inches.	¾	1	1¼	1¾	2	2¼
Price complete, with Reversing Gear	**£25**	**£35**	**£55**	**£80**	**£110**	**£180**
If fitted with Tangye's Patent Governor . . . . . EXTRA.	**£6**	**£7 10**	**£9 10**	**£10**	**£12 10**	**£14 10**

London 1851. New York, 1853 Paris, 1855. London, 1862.

Dublin, 1865

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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(SUCCESSORS TO SAMUEL CROSLEY,)

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Established 1816.

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WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

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STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 16, 1876.

Circular to Gas Companies.

THE Regulations Bill was read a second time, last Tuesday evening, in a House of nineteen members. We need hardly say that it came as a surprise to every one. The ways of Parliament are sometimes mysterious, and it would be uninteresting here to recount the circumstances which led to the unexpected arrival at the Regulations Bill. The House was prepared for a count-out on a motion which stood before that for the second reading of the Bill, but which was astutely dropped. It is true that the result is of little importance, but it is not pleasant to find members who undertake to support the interests of the gas companies, absent from their seats when their services are needed. Nothing, however, would have been gained if the House had been counted out. The Regulations Bill, we know, is doomed; and the legislation for the future is now in the hands of the Board of Trade, who, perhaps, have it in their power to inflict what they like on the companies, and most certainly they propose a very harsh measure. As, however, the companies have virtually consented to it, any arguments directed to show that the new proposals involve gross injustice will be thrown away. We can only wait to see the exact terms of the Bill which the Board of Trade will bring in, before further comment is made. The broad propositions are, of course, before us; but it is understood that some modifications will be introduced, on the representations of the southern companies. What these may be, we do not as yet know, but they can hardly be of much importance.

It is clear, however, that the Metropolitan Board of Works, or at all events the Chairman of the Board, think the suggestions of the Companies and the Board of Trade of some consequence. We do not understand the anxiety of the majority of the Board to keep the nature of the communication from the Board of Trade secret. It must be published this week, and Camberwell and Lambeth will be in just as good a position to raise objections now as they were last week, and, we may add that, they can protest with just the same effect. We do not pretend to know the exact terms of Mr. Farrer's letter, nor, indeed, the concessions the southern companies ask for. We know, however, very well what the final result will be.

The Bill of the Chartered Company, and also that of the South Metropolitan Company, have, at last, been referred to a committee, whose sittings commence to-day, and of which Mr. Walter, the member for Berkshire, is chairman. It may be expected that the Regulations Bill will be referred to the same committee, but nothing is, at present, known on this point. In any case, the proceedings before a committee can be little more than a farce. The Bill of the Chartered Company, which relates to nearly three-fourths of the metropolitan area, has been so settled, that to obtain any alteration of it may be considered impossible. The rest of the companies must go with it. The sinking of a big ship carries smaller bodies down with it in the vortex.

The opposition of the Metropolitan Board to the amalgamation clause in the Bill of the South Metropolitan Company, if that Bill should go forward, will, we have no doubt, be ineffectual. Whatever changes of opinion may have taken place in the minds of the officials of the Board of Trade, we fancy they remain firm in the belief (as we do), that complete and universal amalgamation is the best policy for the Metropolitan Gas Companies. It has been nearly effected north of the Thames, and it ought, and, indeed, might, have been made more complete. The Commercial and the Ratcliff ought to have been amalgamated with the Chartered Company; but the opportunity which presented itself of bringing about such a combination was neglected. It would, of course, at that time, have been opposed by the Metropolitan Board, for reasons which need not now be mentioned; but the amalgamation must, nevertheless, have taken place. Perhaps, to-day, it is not far off.

Such a union would complete the northern amalgamation, with the exception of a portion of the district of the London Company, which, like a Colossus, bestrides the river. No difficulty, however, presents itself on that account. The projected enlargements of the works of the Chartered Company, at Kensal Green and Beckton, will be sufficient to supply the needs of consumers north of the Thames; while, in case of a southern amalgamation, the works of the London Company, devoted, as they stand, to the supply of South London only, would render any enlargement of the works of the other companies unnecessary, for some years to come. Two companies for the supply of the whole of the Metropolis are, therefore, clearly possible, and we hope that, before long, such combinations will be formed. It has to be decided, who shall take the lead in the south. The South Metropolitan Company are promoting a bill for authority to amalgamate. It is the youngest but one of the southern companies, yet may, for certain reasons, be considered entitled to take the lead. A much respected correspondent, who signs himself an "Ex-Secretary," has written the history of the company, with more accuracy than was given by Mr. Fowler last week. The company have practised an amount of self-denial, which certainly entitles them to the consideration we sincerely hope they will obtain. A uniform initial price of 3s. 9d. per 1000 feet, will give the company a decided advantage over all other London companies, but it may be conceded upon principle, having in view the amalgamations which seem imminent. We have, however, to wait for the proceedings which open to-day, in order to learn the course events may take. In the interest of all parties, it may be sincerely hoped that the Board of Trade will at once announce to the chairman of the committee, the course they intend to take, and thus save a large amount of expense to the companies, and much time, doubtless valuable, to the members of the committee. We strongly object to the dictation, but, with the present House of Commons, it may be considered as unavoidable. The times have sadly changed since 1860. The spirit of the gas companies seems to have departed. There was a time when it might almost be said they successfully defied "principalities and powers;" now, we are sorry to say, they bow their knees to the secretary of a Government department.

We must say a few more words as to the "bribe" which has been offered to the companies, in the shape of permission to raise further capital on the simple certificate of the Board of Trade. A moment's thought on this matter will most probably produce a broad grin on the thinker's face. If the older legislation had been adhered to, we will not dispute that a boon might have been conferred; but still, upon constitutional principles, we should have objected. But where, will any one tell us, is the advantage of getting permission to raise new capital, half by way of loan and half by shares, which are to be sold by auction, without application to Parliament? The officials of the Board of Trade must think the directors of gas companies children, if they are to be imposed upon in this way. The day will, in our opinion, certainly arrive, when the Metropolitan Gas Companies (if in existence) will repent their ready acceptance of the sliding scale. They may be able, it is true, to bring such pressure to bear upon the Board of Trade as that which resulted in the passing of the Gas and Water Works Facilities Act Amendment Act, 1872, but that was only a temporary measure, and an eminently unsatisfactory one. We never wish to see an Act of that kind again. But supposing an amalgamated company in existence, an appli-

cation to Parliament, for power to raise further capital, would afford the opportunity of reviewing the effects of past legislation, and of getting rid, as we have pointed out has been done before, of enactments prejudicial to the interests of the companies. Similarly, too, we may point out, in the interests of consumers, that, if the sliding scale should operate to the advantage of the companies, the authorities should have the opportunity of opposing in Parliament any increase of capital, without a guarantee of protection to the consumer. The proposal of the Board of Trade will deprive both company and consumer of the advantage of an appeal to Parliament, and therefore must be condemned by both. If one spark of spirit be left in either gas company or local authority, they will at once denounce the proposal of the Board of Trade as unconstitutional, and subversive of public rights. The opportunity of reviewing past decisions of Parliament must be given, and these are best afforded when companies promote Bills to obtain extended powers. In the case of the Metropolitan Companies, they cannot go for an extension of district—none is possible; but all will require additions to capital, and thereupon arises the chance of obtaining a modification, or a reversal, of previous legislation. We utterly distrust the fatherly, or, as Mr. Lowe would call it, the "grandmotherly" care of a Government department, and we may confess that we prefer to be free for an open fight, whenever opportunity offers. What opinion the Metropolitan Board may entertain of the constitutional aspect of the question, as we put it last week, may possibly be learnt next Friday. A moribund body, they may not, perhaps, care to express any opinion on the matter. With a wish to prolong their existence, they may possibly intimate their willingness to fall in with any suggestion from any department of Government. Such a policy will not, however, satisfy their constituencies (if any member of the Board can be considered to have one), and they had better, at once, set their faces against the most barefaced attempt at centralization yet put forward. The question we have before us now, may be regarded as a small matter; but the Local Government Board, which is fast becoming the most important of Home Government departments, so far as regards municipal matters, may gather courage, if the present proposal of the Board of Trade be carried; and who can tell what will be the next proposition which will emanate from the brain of a Government clerk? We put this question without any intention to give offence; but there are occasions on which a public writer is obliged to be explicit.

The Corporation of Southampton have met with partial success in their opposition to the Bill of the gas company. They have obtained the insertion of auction clauses, with the usual provisions as to the application of any premiums realized. The committee struck out the agricultural district of Hound from the limits—a thing we do not think the company need grieve over. The partizans of the Corporation, we notice, claim as a triumph the incorporation of the Gas-Works Clauses Act, 1871; but this, we may take it, was a mere matter of course. The fight being over, we hope the belligerents will now shake hands, and go on amicably together.

The Llandudno Gas and Water Company are about to pass into the hands of the local authority. The consideration is 7 per cent. perpetual annuities on all the capital, the Local Board, of course, assuming the mortgage debt, and appropriating the reserve-fund of the company. As 10 per cent. had been paid on the greater part of the capital, and there was a fair prospect of the same rate of dividend being continued, we are of opinion that the undertakings have been sold too cheap. The Local Board will, however, have to expend some money on the gas-works, and also in extending the water-works; but, taking all things into consideration, they have made a very good bargain.

Our readers will find food for reflection in the able address of Mr. Dunlop, to the West of Scotland Association of Gas Managers, which we publish in another column. The President has opened up an interesting field for discussion, and we hope it will be well worked. It may be admitted, that the question of the conditions under which the largest bulk of gas, of the highest illuminating power, can be obtained from a ton of coal, is by no means satisfactorily settled. The experiments of Mr. Dunlop are valuable, as contributions towards a solution of the question; but his address leaves much to be desired. Let us hope that Mr. Dunlop and Mr. Young will continue their investigations, and we shall presently learn where, how, and to what extent the action of the exhauster can be most usefully employed.

We are happy to learn that the question of the formation of a Benevolent-Fund will occupy the attention of the members at the coming meeting of the British Association of Gas Managers. The Committee of the Association, we understand, are in favour of the proposal to form such a fund, and the final decision will, of course, be left to the general meeting of the members. We cannot think the result doubtful. Our memory failed us last week, and we forgot the appropriation of Colonel Croll's donation of £100. It was originally designed to form the nucleus of a Benevolent-Fund; but as the Committee of the Association reported, in 1873, that their inquiries did not justify them in recommending the establishment of such a fund, Colonel Croll, anxious to serve the interests of the Association, requested them to accept his donation, and apply the interest, in the shape of premiums, for meritorious papers read before the Association. We could fain wish that both a Prize-Fund and a Benevolent-Fund were co-existent possibilities, but we cannot recommend too many drafts on the pockets of the members.

Water and Sanitary Notes.

It is not a matter of much regret to us that we find our columns so full at this period of the year, that we have no space for even a very condensed report of the proceedings at the Conference of the Society of Arts, alluded to in our last. It began, continued, and ended in talk, such as those who have been in the habit of attending meetings of a like kind can well appreciate. So far as we can make out, not a single new fact was brought out in the course of all the discussions. The old, old stories were repeated over and over again. Mr. R. Rawlinson, C.B., once more counselled local authorities not to look for profit on the disposal of their sewage, but to be content to get rid of it at some little cost, without nuisance, if possible. Mr. Hope produced a satisfactory "nitrogen" balance-sheet, but was mysterious as to financial results. "Sewage," he says, "is worth 10s. per head "of the population;" but he adds, "that no one can afford to "pay that sum," a contradiction we do not understand.

As regards the success of precipitation processes, very little information of a useful kind appears to have been communicated. The Native Guano Company were well represented, and we were told, once again, that manure, valued at 30s. a ton, was freely bought for £3 10s.—a story we have heard for, we forget how many years. But they do not sell their manure at Leeds, although, if our memory serves us, reports of experiments on the farm of the Leeds Corporation have shown its value. The Coventry process is admitted to be a failure financially, and the Sewage and Manure Company will, in future, require a subsidy of 1s. per head of the population. The Phosphate Sewage Company were represented by their agent at Hertford, who could only say that a very pure effluent was obtained, with which, however, the Lea Conservancy Board are by no means satisfied. The results of the conveyance of town sewage to the sea hardly received the consideration it deserved. At Brighton, it was admitted that the consequences were, at present, not satisfactory; and we are of opinion that, in the event of the occurrence of a long hot summer, serious complaints will arise. The reduction of the sulphates in sea water, caused by the presence of organic matter, results in the production of sulphuretted hydrogen, the smell of which is perceptible miles from land; and it is quite possible that the sea at Rottingdean will smell like rotten eggs. Sir J. Hawkshaw's plan for the disposal of the sewage of Glasgow may end in producing a like result. We note with regret the entire absence of a mention of Mr. Bailey Denton in connexion with this conference. The reports we have seen may not be perfect; but, certainly, no account of operations for the purification and utilization of sewage would be complete without full details of Mr. Bailey Denton's system.

The Thames Conservancy Board have given notice to the Local Board of Surbiton and of other districts that, if steps be not taken to divert their sewage from the river before the first day of July next, or a satisfactory method of purification be not adopted, proceedings will be taken under the powers of the Board. The announcement, which can only be considered as a *brutum fulmen*, has created some consternation, and has roused the several authorities into some sort of activity. Richmond and neighbouring Boards are scared, and now we have a proposal, which should have been made years ago, that the Vestry of Richmond, and some authorities above, should join in a scheme for the disposal or treatment of their sewage. The suggestion comes late, and the projectors have now to contend with Colonel Cox's report. It is perfectly competent, and may be considered desirable, that Richmond should combine with other districts in the purification of sewage, but the economy of such a proceeding is certain to be called in question. It is clearly Colonel Cox's opinion that each separate district may most cheaply dispose of or treat their own sewage. The land at the disposal of the Richmond Vestry is certainly not available for the treatment of more sewage than Richmond alone produces.

The debate on the Windermere scheme, as recommended by the Water Committee for the adoption of the Liverpool Town Council, has commenced, and we are sorry that the pressure on our space does not permit us to give a report. Liverpool is fortunate, in

having some of the foremost men in the borough in the Municipal Council. The question now before the Council is of the highest importance. The result may be the expenditure of two millions of money, the water debt of the Corporation already amounting to two and a half millions. It concerns, also, the future sanitary condition of Liverpool and the suburbs. The Council have approached the subject in a becomingly serious spirit, and nothing like a personality was heard in the course of the debate. The leading opponent of the Windermere scheme advocated delay, and further efforts for the prevention of waste; but, towards the end of his speech, he adopted a suggestion we made some months ago—that, if the Windermere scheme were carried, it should be in conjunction with other Lancashire towns, which would greatly reduce the expense. Lancaster and Preston lie in the direct line of route proposed for the pipes, and might cheaply participate in the advantage. Other important towns are not far off, and even Manchester might join at a less cost in the Windermere than in the Ullswater scheme. The debate is adjourned for a fortnight, to give time for the members of the Town Council to make themselves better acquainted with the plan proposed. In our opinion, it is not difficult to foresee the result of the discussion. The majority of the Council, we believe, are in favour of the scheme, but the difficulty will arise when they have decided. We say it with great regret, but we fear that the Borough Funds Act, if not amended this session, as we have suggested, will stand in the way of the Town Council.

We could not, last week, give the decision of the Commons Committee on the Stockton and Middlesbrough Corporations Water Bill, which provides for the compulsory sale of the company's undertaking by arbitration. The Committee, in their decision, laid it down that, "in addition to the sums payable "to the company, as set forth in the clauses of the Bill, "the arbitrator shall take into consideration what sum shall "be paid for compulsory sale, and also what additional "sum shall be paid in respect of the prospective value of the "undertaking." It may be doubted whether the Corporations will care to go on, so weighted. But the committee were still harder on the Corporations. They insist that the new works proposed shall be completed within a reasonable time—say two years—but the Corporations ask for ten years before they replace the life-destroying diluted sewage of Barnard Castle with the peaty compound from the Balder and the Lune. It is, of course, a question which we cannot answer, whether or not the Corporations ever intended to make the works they proposed, if they got possession of the company's undertaking. We have no information at present as to further proceedings in the matter; but, to enliven our usually dull columns, we give here a small *jeu d'esprit*, which has reached us, that expresses pretty clearly a view we ourselves entertain, if the arbitrator be just to the company. We do not for a moment believe the story told us, as to how the verse was obtained; still, we are not in a position to say that the copy sent us, did *not* come out of the pocket of the chairman of the company.

"Says the King of Siam,
'You think that I am
Making a present to you;
But a white Ele*phant*
Is a troublesome grant,
And a gift you may presently rue.'"

The explanation of Major Weiland, which will be found in another column, is of some importance. A thousand a year for a supply of water to offices in the City of London was incredible, but Alderman Carter seemed to base his denunciation of the extortion of the New River Company, on the assumption that the original statement was true. We shall endeavour to find out at what rate the premises would have been assessed, but it may be presumed that Major Weiland did not inquire, for he must have dug his well before he commenced his buildings.

Bolton Corporation Water-Works.—The *Bolton Chronicle* gives a long and interesting history of the water-works in that borough, and remarks that the Wayoh reservoir is now completed, Captain Galton, the engineer appointed by the Board of Trade to inspect the works, having forwarded to the town-clerk a certificate to that effect. The corporation are now, therefore, in possession of the Entwisle reservoir, and will be able to supply the surrounding townships with water. The Wayoh undertaking extends back for a period of 12 years, the initial step having been taken at a meeting of the Town Council held on July 15, 1863. The cost of the Turton and Entwisle scheme has been £252,748, which, together with £285,419 expended on the purchase and extension of the old works, makes the aggregate cost of the old and new water-works up to the present time £538,168.

New Companies Formed.—A company called the "General Heat and Light Company, Limited," has been formed to purchase the patents granted in 1875 to Mr. Joshua Kidd, for "Improvements in the manufacture of gas for heating or other purposes, and in the materials and apparatus employed therein." Also to purchase any extension of the same, and also Mr. Kidd's interest in any other patents, including that granted in 1873 to Mr. A. Barff, for "Improvements in the utilization of heat for the generation of steam, and in apparatus employed." It has been registered, with a capital of £20,000 in shares of £5, of which 2000 will be issued as A or preferred shares, and the remainder as B or deferred shares. The purchase consideration is £10,000, of which £6000 is payable in fully-paid shares.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XCV.

Portslade Gas-Works.

The accompanying engravings represent different portions of the Portslade works, designed by, and constructed under the direction of, the engineer of the Brighton and Hove Gas Company—Mr. John Birch Paddon, M.Inst.C.E.

Under the company's Acts of Parliament, the only site available for these works was a bank of beach land lying between Shoreham Harbour and the English Channel. The site affords great facility for the discharge of coals, which are lifted by steam cranes, and conveyed, by viaducts and rails, either into the retort-house, and deposited in front of the retorts, or into the coal stores for subsequent use.

These works are simply a manufacturing station of the company. The gasholders in combination therewith are situated at Hove, about two miles nearer the town of Brighton, the mains for one-half the distance being 16 inches, and the others 14 inches diameter. These mains offer a most remarkable instance of the degree of perfection which may be achieved in this branch of gas engineering, for after they were laid, in order to prove them, they were subjected to a pressure of 24 inches, without any appreciable difference in the temperature of the gas enclosed, and as, during five hours trial, the loss was only one foot, they must be regarded, in every sense of the term, as perfectly tight and sound.

A peculiar feature in these mains is, that a receiver, provided with a sliding disc on the top, is placed at intervals of 500 yards apart from the one to the other, for the purpose of removing any accumulation of naphthaline that might occur. This would be accomplished by opening the sliding disc beyond the point obstructed, when, by the force of the exhauster, any deposit of naphthaline would be expelled.

The first engraving represents rather more than half the plan of the works as now actually in operation. The other portion, being intended for future augmentations, is at present occupied only by a residual shed, and, therefore, possessing no interest, is not shown.

The general arrangements of the buildings will be understood at a glance. The retort-house is 284 feet 6 inches long, and 80 feet wide, and contains 24 benches of double retorts, each bench having eight cylindrical retorts of 16 inches diameter and 20 feet long, each retort being capable of carbonizing one ton of coal per diem. Thus, allowing one-sixth of the retorts to be in reserve, the remainder will produce 1,500,000 cubic feet of gas in the 24 hours, or 300 million feet per annum. When extended business, however, requires the erection of the other retort-house (identical with that represented), the capacity will then be increased to 3 millions per diem, or 600 millions per annum. The coal carbonized by the company is about 30,000 tons per annum; and of this quantity it is estimated that, under ordinary conditions, about 25,000 tons pass directly from the ships into the retort-house, thus reducing the expenses on this point to the minimum. The coal-store is 180 feet long and 160 feet wide, and will hold, without trimming, 6500 tons of coal, equal to a supply of six weeks during the depth of winter. The coals are discharged from the holds of the vessels on to the viaduct by two steam cranes, each of which can discharge 25 tons per hour, the waggons with the coals being driven into the retort-house and store in that time. A small portable steam-crane lifts the coal into the waggons from any part of the store, to be conveyed to the retort-house.

The retort-house has no coke-vault, the charging-floor being slightly elevated above the level of the coke ground, a system of trams being laid for conveying the coke from the former to the latter. The positions of all the various apparatus, offices, and stores are indicated in the plan.

The second drawing is a longitudinal section of a portion of the retort-house, showing one of the blocks of settings in elevation, also a portion of the viaduct supported by cast-iron columns. The general character of the building is decidedly ornamental, and this result has been obtained at little cost. Each block of retorts is provided with its own chimney, of a height of 71 feet 6 inches, with an area of about nine square feet. The lower part is built of brickwork, braced together with iron bars. The upper part is formed of wrought iron, and protrudes a few feet above the ridge of the roof. The chimneys were constructed in this manner so as to be sufficiently light to be placed on the retort-beds, in order not to occupy floor space. In the roof of the retort-house is a ventilating shaft, 10 feet in diameter, surrounding each chimney, and, in addition to these, there is a protected opening 5½ feet wide, extending the whole length of the ridge, which permits of the free escape of the smoke and steam.

Below the floor, and immediately in front of the furnaces, on each side of the retort-house, is a series of culverts, shown in cross section, for the purpose of admitting a good supply of air into the retort-house, and capable of being regulated at pleasure. By mear of these culverts, water is conveyed for supplying the ash-pans, and the drainage of the retort-house is also accomplished. All these important advantages are too often neglected, and, so far as we are aware, this is the only works where such culverts have been introduced.

We give also a plan of that part of the retort-house represented in elevation, but showing a part of the second block of retorts with the connexions of hydraulic main, and the pipe conveying the gas along the retort-house, so as to retain it in contact with the tar for a time, to profit by the purifying powers of the latter, previous

to passing on to the condenser. Amongst the other useful details in the construction, we may mention that at the corner of each block of retorts is placed a water-tank, the whole being in communication, so that a proper supply of water is ensured for quenching the coke. The viaduct is also shown in plan.

The next is a cross section of the retort-house, by which the construction of the roof is readily understood. It is very lofty—a very desirable consideration for the workmen. The viaduct, main and lower flues, culverts, and means of draining retort-house, are all shown in section. The capacity of the storeage for coal is also obvious; this, when filled as represented, being sufficient for three or four days operations. Altogether, the engineer may be congratulated on his success in producing such buildings, with the excellent arrangements of trams throughout for the transport of the coal and coke.

Amongst the innovations introduced by Mr. Paddon in the various apparatus, the most conspicuous is the scrubber, which is entirely different to that generally employed. This apparatus consists of a cast-iron tank of about 20 feet long and 10 feet wide, square at the base and semi-cylindrical above. It is shown in the drawings in cross and in horizontal sections. In this tank is adjusted a shaft, with its bearings, extending the whole length of the tank, having two intermediate supports; and on the shaft are placed 18 perforated circular discs, each of the diameter of about 9 feet 6 inches. The shaft, with the perforated discs, is connected to the engine by suitable gear work, and makes, when in action, about 50 revolutions per hour. The tank is half filled with liquor, so that the discs in revolving present a large wet surface for the absorption of the ammonia from the gas, whilst the ammonia, as the discs revolve, is absorbed by the liquid in the tank.

Of these scrubbers, there are three in operation. The first, in which the crude gas enters, is placed somewhat lower than the second, and this again lower than the third; so that as the liquor in either of the vessels becomes saturated to the desired extent, it is allowed to flow off by gravitation.

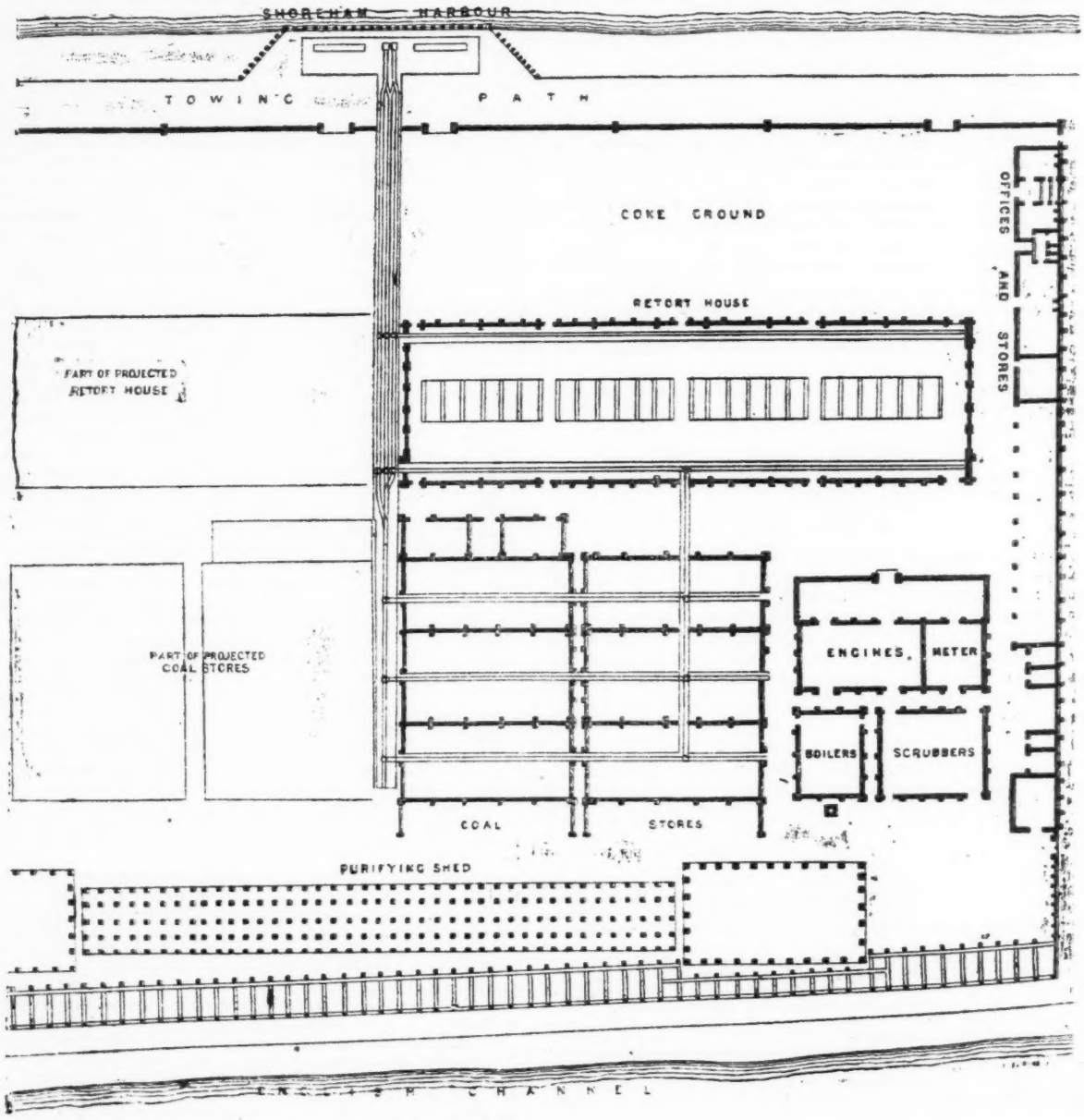
That this system of scrubber possesses some advantages there can be no question; firstly, because the same amount of absorbing surface for each revolution must always exist, and the inconvenience is avoided which sometimes occurs in the tower scrubber, where, by the accumulation of tar and a dense deposit of salt, the course of the liquor is diverted, so that it comes, consequently, into contact with a very limited extent of surface, and the apparatus is rendered proportionably ineffective; secondly, because, by increasing the speed, the vessel will become more effective when necessity requires it; thirdly, because the liquor can thus be made to acquire any degree of strength before being withdrawn from the first vessel; and lastly, according to Mr. Paddon, the force required to work the apparatus is inconsiderable.

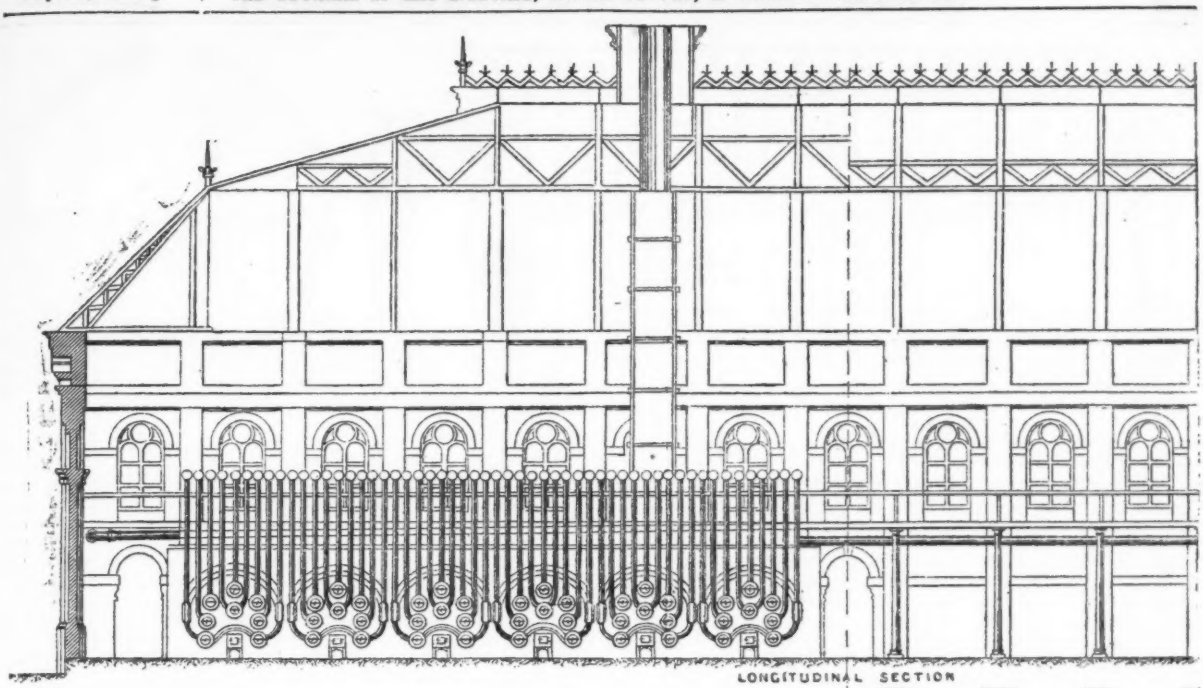
There are seven purifiers placed in a line with each other, each being 36 feet long, 18 feet wide, and 5 feet deep, the water-lutes being 2 feet 3 inches deep. The covers are raised by a travelling lift, passing on rails the whole length of the shed. There are also rails for conveying the purifying material to and from the purifiers. The reviving sheds at either end of the purifying shed are each 100 feet long and 50 feet wide, and are fitted with moveable louvres to regulate the ventilation.

In addition to the condensing-pipes in the retort-house, there is a horizontal condenser, formed by about 500 feet of 16-inch main; also a vertical air condenser, which, however, differs from those generally in usage, by having a double row of rising pipes, dispensing with the seal cups, and having a ventilating chamber beneath, by which means the quantity of air passing, and consequently the condensing power of the apparatus, can be easily controlled.

There are two 30-horse power boilers and four exhausters, two of which are for relieving the retorts, one being in action, the other in reserve, the other two are for propelling the gas to the holders. Each exhauster is worked by a separate engine, and has its governor in combination. The station-meter of a capacity to pass 100,000 feet per hour, made by Messrs. Parkinson three years ago, was considered at that time one of the largest constructed.

The entire cost of the works was £72,000, and when the second





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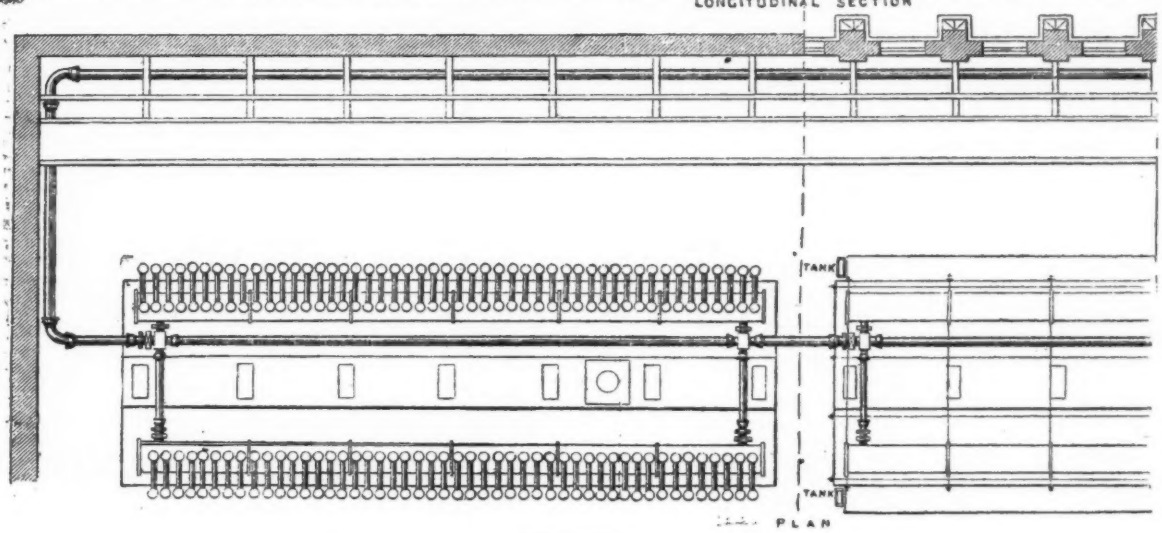

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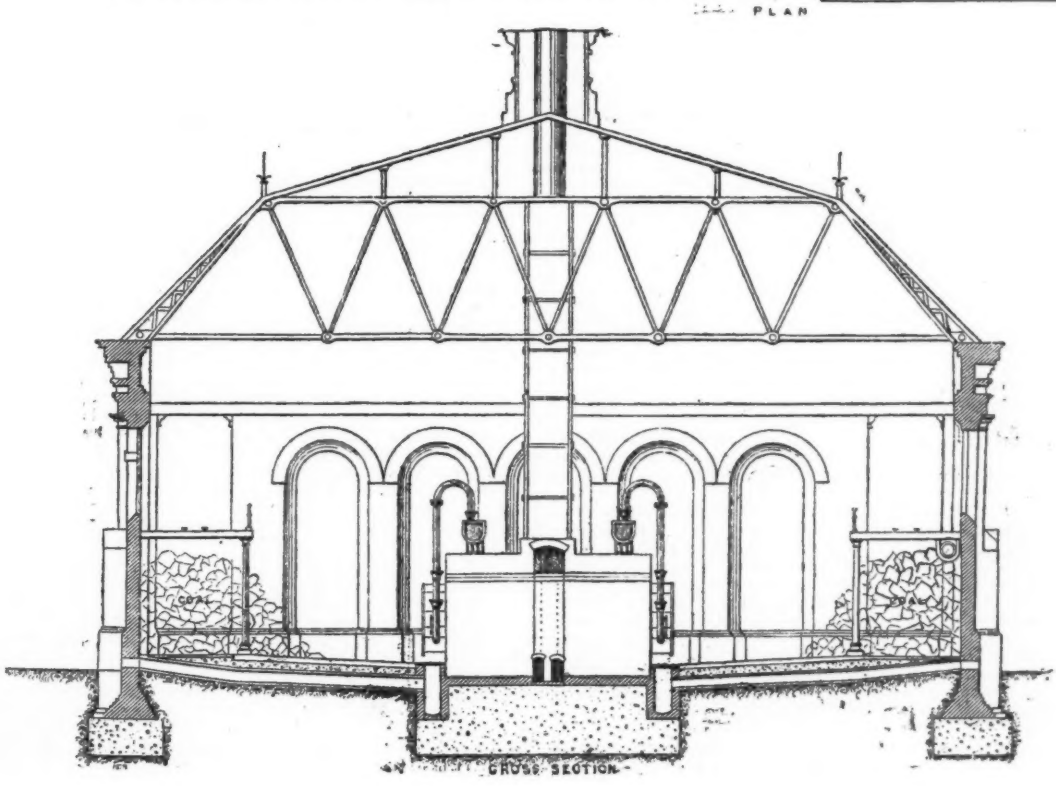

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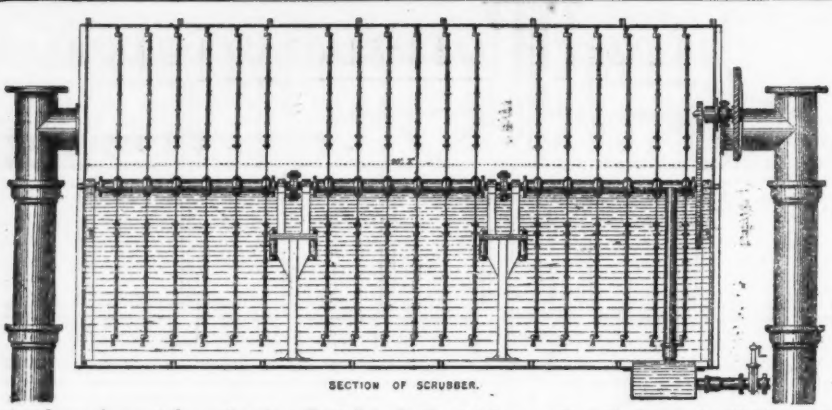
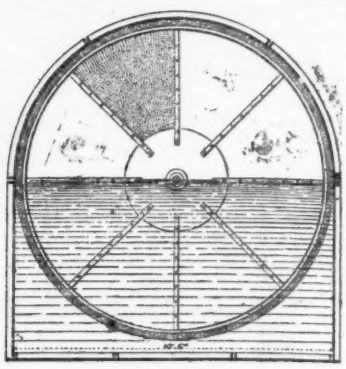


SECTION OF SCRUBBER.



SECTION OF SCRUBBER.

retort-house is erected on the site allotted to it, the total expenditure will be about £100,000.

Some years ago the deterioration of gas, in its passage through the mains, was considered to be very great; indeed, equal to two or three candles loss of illuminating power, when traversing a few miles of main. This opinion, which was universally shared by gas engineers, led to the stipulation in some Acts of Parliament, that the illuminating power of the gas should be tested within 1000 yards of the works in which it was produced. The error of this, experience has since made evident, but nothing has been so decisive as the experiments instituted by Mr. Paddon, with the view of solving this doubtful question, for which he possessed very great facilities.

As we have already stated, the holders are situated at Hove, about two miles from the works in question; the testing office at Brighton is two and half miles from the holder-station. The company's mains extend in another direction to Lancing, altogether a distance of 10 miles. Observations were made simultaneously at these three places on various occasions, in order to ascertain the illuminating power of the gas. These experiments extended over three weeks, with the following results:—

The average illuminating power of the gas at—

Hove	being	14·61 candles.
Brighton	„	14·45 „
Lancing	„	14·14 „

From this it will be seen that the gas, after travelling 10 miles, lost little more than 4 per cent. of its illuminating power. Whether this arises from the condensation of the volatile hydrocarbons, or the action of exosmose and endosmose, is a matter of doubt; but, in all cases, it is highly satisfactory to be thus assured of the permanency of the illuminating constituents of coal gas. It may be further stated, that Mr. Paddon's experiments are confirmed by the various gas inspectors or testers of the Metropolis; as, in a distance of several miles, the illuminating power of the gas of a company, as proved by two or more testers, acting independently of each other, corresponds in a very remarkable manner.

(To be continued.)

Correspondence.

SOUTH METROPOLITAN GAS COMPANY AND THE METROPOLITAN BOARD OF WORKS.

Sir,—Allow me a few lines in regard to Mr. Fowler's (the member for Lambeth) observations upon this company. Mr. Fowler is so esteemed in his own vestry, and also on the above Board, that any observations from him come with twice the weight they would from any other member. It is, therefore, to be regretted that he should have been misinformed upon any details upon which he speaks. *O si sic omnes* with other members of that Board, in opposition to that company.

Allow me, therefore, with all deference, to supplement some correction of details which occurred nearly half a century ago.

The present South Metropolitan Gas Company were established in 1829, and then built a wall round the ground rented by them from the Surrey Canal Company, which they still occupy.

Mr. Baker, the Coroner of Middlesex, was then one of the directors, and continued on the board till his death. He was succeeded in the directorate by his son and heir, who only resigned his seat in December last.

The company were formed to oppose the Phœnix Company at the above date, with unlimited liability, under Deed of Settlement; and no transfer has ever taken place, except of separate shares, from time to time.

In 1833, under the engineership of the late clever, though impracticable, George Palmer, they first supplied cannel coal gas of 24-candle power, at 11s. per 1000 cubic feet, against the Phœnix at 9s., for gas of 12-candle power.

Nearly all the directors (except Mr. Baker) were not much to be depended upon down to 1834. Then there joined the company, Mr. Holgate Foster, as chairman, Alderman Farncomb, the present chairman (Mr. Simpson), and the present deputy-chairman (Mr. Drew), all men of first-rate standing. At that time they had managing directors of questionable characters; but the late Mr. Thomas Livesey, having been appointed secretary in 1839, managed to eject these men from the directorate, and to fix himself in the entire management, both as engineer and secretary. He was a most honourable, trustworthy man, and turned out in every way an excellent manager for the company.

The late Mr. Thomas Livesey was nephew to his namesake, the deputy-governor of the Chartered Company, and, in 1839, was clerk in the light office of the latter company, in Brick Lane. He was not then much acquainted with gas engineering, or the details of gas-making, or secretarial duties; but in the former duties he was assisted (*re natâ*) by the late senior Kirkham, of the Imperial Company, a valuable and practical man, but without much scientific education.

In 1842 the company obtained their Act of incorporation without any opposition; Lord Redesdale then inserting therein the model clauses which afterwards, in 1847, became the general law, under the title, "Gas-Works Clauses Act."

The consumers did not then, never have, and never will, value cannel coal gas. They only waste it in smoke, or blackening their ceilings.

An Act should be passed, giving power to each company to fix the place where lights are required for the trade or otherwise, the description of burner and glass to be used according to the light-giving powers of the gas, and subjecting to penalties. This carried out with the same price of gas, would reduce the gas bills one-half.

About this time the company ceased to make cannel gas, and commenced to work with Newcastle coal, and soon after began paying a small dividend.

From 1843 to 1860 the company made much more profit, but the proprietors, with extreme forbearance, limited themselves to a modest 6 per cent. dividend, although legally entitled, under their Act, to 10 per cent. From this unusual and uncalled-for forbearance arose the £80,000 or more expended upon works out of profits (alluded to by Mr. Fowler). Certainly they have expended no money upon experiments to perfect gas-making, as the Chartered Company have; but then the latter company likewise forbore a 10 per cent. dividend, and received only 6 per cent., and expended out of profits £300,000, which, unjustly, they have not been allowed to capitalize, as the City, the Imperial, and the Phœnix Companies have done. But the South Metropolitan never having capitalized this £80,000, and having supplied gas at 3s., when they have been unable to make it at that sum, are they not entitled to some extra consideration now?

The only time they ever raised the price of gas was in 1854, when, owing to the increase in the cost of coal, iron, and wages, they rose from 4s. to 4s. 6d., at which price they were supplying it at Midsummer, 1860, when the Metropolis Gas Act passed, and thereupon they immediately fell to 4s., the Phœnix falling to 4s. 3d.

By extreme good management and judicious economy, their cost of manufacture (although their works are not on the river side) has for the last 30 years been less than that of most of the London companies, and it was a true and just ambition of the late Mr. Thos. Livesey "to take the lead."

At the present price of coals, iron, and labour they are not earning profit enough to pay their dividend, but are dipping into their reserve of former years. It is a great boon to the consumers that they are not paying more than 3s., while in other parts of London the consumers are paying 3s. 6d. to 3s. 9d., and in Shoreditch the consumers are raised, by the amalgamation of the Independent with the Chartered and Imperial Companies, from 3s. 4d. to 3s. 9d. The South Metropolitan Company are virtually pledged in honour not to raise their price above 3s. for the purpose of paying *more* than a 10 per cent. dividend, but only to such a price (if coals rise) as will yield their usual dividend. Now, if we are adopting the last fashion in education and gas-making, of "paying by results"—if we mulct the gas company a quarter per cent. of dividend because coals rise—if we are to establish an uniform price throughout the Metropolis, surely we ought to deal with the South Metropolitan Company with a tender hand on these accounts—

1. For forbearing in former years to receive dividends to which they were entitled.
2. For manufacturing cheaper than any other company, and
3. In order that the initial price of 3s. 9d. should be uniform.

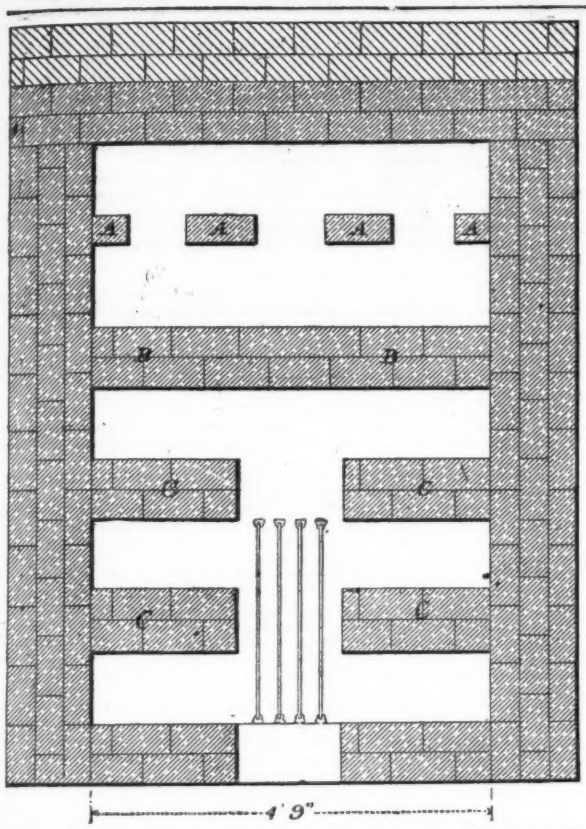
It is, therefore, contended that the South Metropolitan Company have a right to demand that the Metropolis Gas Bill should pass as reported to the House of Commons last session, with the exception of an amendment as to the mode of estimating the illuminating power, introduced into the Commercial Act of 1875, and as to raising new capital (under certificate from the Board of Trade)—one half by debenture stock, and the other half by the auction clauses; the premium in the latter case to go, without dividend, to the benefit of the consumers, and the discount, if any, to go, with dividend, to the injury of the consumers.

An Ex-Secretary.

RETORT-SETTINGS.

Sir,—I beg to enclose plan of three retort-settings. It can also answer for two or five; but if for five, the setting must be wider. In my opinion, it possesses advantages over Mr. Hall's and Mr. Anderson's designs. Mr. Hall's takes too much space, and Mr. Anderson's has the objection of the brick retort, which I do not think would answer in country works, where the charges are so irregular, and the heats so often varying.

In the accompanying design the dwarf wall marked A A is built close up to top of arch. The furnace occupies the space between the front wall and the 9-inch solid wall, marked B B. The piers, marked C C, are bridged over by arch-bricks. The heat passes up the spaces between the piers, C C, passes over 9-inch wall, B B, which is built up to within 12 inches



of top of arch, passes down between walls B B and A A, escapes by openings at bottom of wall, A A, between back of retorts to top flue, thence to chimney.

The elevation is the same as Mr. Hall's design, and I shall be most happy to give any other explanations required.

W. M. A.

GLASGOW WATER SUPPLY.—Dr. E. J. Mills, of the Andersonian University, Glasgow, reports that the city water during April contained "vegetable hairs and just visible particles of ochre;" the water was, however, free from all evidence of previous sewage or animal contamination, and was lighter in colour than in the previous month.

THAMES VALLEY DRAINAGE.—At the monthly meeting of the Surbiton Commissioners, on the 8th inst., a letter was read from the solicitors of the Thames Conservators, stating that after the 1st of July next the conservators intend to take proceedings against them and all other persons and sanitary authorities who have not complied with the notices served upon them to discontinue the flow of sewage and other offensive matter into the river Thames and its affluents, and whose time, stated in the notices, would then have expired, without further notice. In consequence of this notice the Richmond Rural Sanitary Authority have asked the Richmond Select Vestry to join with them in an application to the Local Government Board to form a united district, consisting of the parishes of Richmond, Mortlake, Barnes, and Kew, for sewage purposes. At a meeting of the vestry on the 9th inst., it was resolved that, with a view of carrying out the recommendations of Colonel COX, the Government inspector, the clerk should ascertain if various local authorities are willing to join with Richmond in the disposal of their sewage.

EVESHAM GAS SUPPLY.—A meeting of the Evesham Conservative Association was held on the 1st inst., to consider the advisability of petitioning the Town Council to take steps to purchase the gas-works. The chairman (Mr. G. Tredwell) referred to the origin of the present gas company, some few years after the introduction of gas in Evesham by a private individual in the year 1835. He condemned as monstrous the 40 years contract for lighting the public lamps which was made by the old council before he was eligible. He advised them to petition the council to purchase the works, and take the "bull by the horns" before it was too late. In the contract for 40 years lighting it was provided that if either party wished to determine it when one half of the term was expired, they could do so by giving twelve months notice. One half of the term would expire on Sept. 5, 1877, and if they did not take action now they would have to wait another 20 years before a similar opportunity occurred. Mr. W. T. Allard moved—"That, in the opinion of this meeting, it is desirable, for the benefit of the town, that the gas supply should be in the hands of the Town Council." An amendment was proposed by Mr. A. W. Byrch, to the effect that it would be better to further consider the matter before asking the council to take action. Ultimately the resolution was carried by a large majority

NOTTINGHAM CORPORATION GAS-WORKS.—At a meeting of the Nottingham Town Council on the 1st inst., the Gas Committee reported that, in pursuance of the powers conferred upon them by the council on Feb. 8, 1875, they proposed to raise the sum of £13,000, new capital, to cover the costs of the extension works at the Basford Gas Station. Hitherto such capital had been raised by mortgage bonds. The committee found that it would be advisable to create debenture stock instead of raising the money by mortgage bonds. Debenture stock was more easily dealt with in the market, and some persons who were disposed to advance money to the corporation would prefer to do so on debenture stock. The Town Council were empowered to create such stock by the Nottingham Corporation Gas Act, 1874. The total indebtedness of the corporation, on account of the gas undertaking, up to the present time, including the proposed loan of £13,000, is £101,362. The committee were also empowered to carry out certain extension works at the Nottingham and Radford Stations, which were estimated to cost the sum of £18,000. They therefore recommended that the Town Council create debenture stock to the amount of £119,362, and that the committee be authorized to convert the present mortgage debt into debenture stock as opportunity may arise and to issue at once so much of the said stock as might be necessary to enable them to cover the costs of the extension works at Basford, Radford, and Nottingham. They recommended that the interest on such stock should be fixed at 4 per cent., but they believe it can be placed on the market above par.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY 8.

The Lord Chancellor acquainted the House that no further Standing Orders are applicable to the Walsall Gas Purchase and Borough Extension Bill.

The British Gaslight Company (Hull Station) and Padiham and Hapton Local Board Bills were reported, without amendment.

The Gorleston and Southtown Gas Bill was read a second time, and committed.

TUESDAY, MAY 9.

A report was read from the select committee on the Blackrod Gas Bill, that they had not proceeded with its consideration, no parties having appeared in opposition thereto.

THURSDAY, MAY 11.

The Walsall Gas Purchase and Borough Extension Bill was read a second time, and committed.

The British Gaslight Company (Hull Station) and Padiham and Hapton Local Board Bills were read the third time, and passed.

A petition was presented by the Corporation of Poole against the Poole Gas Order of the Gas and Water Orders Confirmation (Chapel-en-le-Frith, &c.) Bill.

FRIDAY, MAY 12.

The Rossendale Union Gas Bill was reported, with amendments.

The Gas and Water Orders Confirmation Bill was considered in committee.

HOUSE OF COMMONS.

MONDAY, MAY 8.

On the motion of Sir CHARLES FORSTER, it was ordered that the minutes of evidence taken before the committee on the Longwood Gas Bill, in session 1875, be referred to the committee on the Colne Valley Gas Bill.

Examiners report, in respect of non-compliance with the Standing Orders in the case of the petition for additional provision in the North-East Worcestershire Water Bill, presented, and referred to the Select Committee on Standing Orders.

The Dewsbury and Heckmondwike Water Bill was reported.

The Local Government Provisional Order, Skelmersdale (No. 5) Bill, was considered in committee, and reported.

A petition in favour of the Burghs (Scotland) Gas Supply Bill was presented from Govan.

The petition of the Argyll District Road Trustees for the district of Kintyre against the Campbeltown Burgh and Harbour Bill was withdrawn.

METROPOLIS GAS COMPANIES ACCOUNTS.

Sir CHARLES DILKE asked the President of the Board of Trade when the annual accounts of the Metropolitan Gas Companies would be presented.

Mr. W. H. SMITH said: When the accounts have been received, they shall at once be presented. The Metropolis Gas Act, 1860, however, does not require those companies who are still under its provisions to send in their accounts until two months after their general meetings. It is not probable, therefore, that all the accounts will be received at the Board of Trade until the middle of June.

TUESDAY, MAY 9.

The following resolution, reported from the Standing Orders Committee, was agreed to:—"That, in the case of The Gaslight and Coke Company Bill, petition for additional provision, the Standing Orders ought to be dispensed with. That the parties be permitted to introduce their additional provision accordingly, if the committee on the bill shall think fit."

The Maidenhead District Gas Bill (Lords) was reported, with amendments.

The Stockton and Middlesbrough Corporations Water Bill was reported.

A petition in favour of the Burghs (Scotland) Gas Supply Bill was presented from Aberdeen, and one in favour of the Metropolis Gas Companies Bill from Southwark.

Petitions in favour of the Colne Valley Gas Bill were presented from (1) Inhabitants and consumers of gas of Longwood, Golcar, and Linthwaite, (2) Golcar Local Board, (3) Longwood Local Board, (4) Linthwaite Local Board; and for the insertion of a clause in the Galashiels Municipal Extension, Police, and Water Bill (Lords) from William Elliot.

The Colney Hatch Gas, The Gaslight and Coke Company, and South Metropolitan Gaslight and Coke Bills were referred to a select committee, consisting of Mr. Cowper-Temple (chairman), Mr. C. W. Wynn, Colonel Stuart, and Mr. Knowles; to meet on Tuesday, May 16. On Thursday, May 11, Mr. Cowper-Temple and Mr. C. W. Wynn were discharged from, and Mr. Walter (chairman) and Mr. Ryder added to the committee on the Colney Hatch Gas, The Gaslight and Coke Company, and South Metropolitan Gaslight and Coke Bills.

BURGHS (SCOTLAND) GAS SUPPLY BILL.—The committee on this bill was deferred from the 11th inst. till Thursday, May 18.

METROPOLIS GAS COMPANIES BILL

Sir JAMES HOGG, in moving the second reading of this bill, said: I do not propose to occupy the attention of the House by entering into any lengthened details. The bill is substantially the same as that which was introduced by the Metropolitan Board of Works last year, and referred to a select committee, presided over by the right honourable gentleman, the member for Bradford (Mr. W. E. Forster). The provisions of the bill brought in last year were accepted by two companies, the Commercial and the Ratcliff, and this year three companies—namely, The Gaslight and Coke Company, the Imperial Company, and the Independent Company—who have become amalgamated, have virtually accepted the same terms, incorporating them in a bill of their own. Those clauses were considered by the select committee last session to be very favourable to the consumers. The object of the present bill is to secure uniformity of legislation, and it applies to the remaining companies. As was done last session, I propose to take the second reading, and then to refer the bill to a select committee. I believe the House will consider that uniformity of legislation is desirable, and therefore it is not necessary that I should trouble you by reading any extracts from the evidence upon the subject. I may, however, mention that the great principles of the bill are these,—that the dividends of the companies shall be regulated by the price charged by them for gas. The initial price is fixed at 3s. 9d. per 1000 cubic feet, and the illuminating power at 16 candles; and it is provided that the dividends shall decrease or increase at the rate of 5s. for every penny of increase or decrease in the price of gas. The Metropolitan Board of Works consider that the adoption of these principles will tend to produce economy. I beg now to move the second reading of the bill, and to express my regret that the rules of the House render it necessary that the bill should be referred to a select committee.

The bill was then read a second time.

Sir J. HOGG then moved that the bill be referred to a select committee.

This motion was also assented to.

WEDNESDAY, MAY 10.

The Slaithwaite Gas Bill, as amended, was considered; amendments made; bill to be read the third time.

The Huddersfield Water and Improvement Bill was reported.

A petition against the Burghs (Scotland) Gas Supply Bill was presented from Coldstream, and one in favour from Motherwell.

The petition of Edwin Redding against the Bristol United Gas Bill, and of Hugh Scott against the Galashiels Municipal Extension, Police, and Water Bill (Lords) were withdrawn.

THURSDAY, MAY 11.

On the motion of Sir CHARLES FORSTER, it was ordered that the minutes of the evidence taken before the committee on the Metropolis Gas Companies Bill, in session 1875, be referred to the committee on the South Metropolitan Gas-light and Coke Bill.

Examiners report presented—"That the Standing Orders not previously inquired into have been complied with in the case of the Leigh and Hindley Local Boards Bill (Lords)." Bill to be read a second time.

A petition for additional provision in the Horncastle Gas Bill was referred to the Examiners.

The Local Government Provisional Order, Skelmersdale (No. 5) Bill, as amended, was considered; to be read the third time.

FRIDAY, MAY 12.

The Colne Valley Gas Bill was reported. Preamble not proved.

The Southampton Gaslight and Coke, Bristol United Gas, and Spennymoor and Tudhoe Gas Bills were reported.

The South Hants Water Bill, as amended, was considered; to be read the third time.

The Local Government Provisional Order, Skelmersdale (No. 5) Bill was read the third time, and passed.

A petition against the Metropolis Gas Companies Bill was presented from Lambeth.

HOUSE OF COMMONS COMMITTEE.

FRIDAY, MARCH 31.

(*Before Mr.* ORR-EWING, *Chairman; Col.* RUGGLES BRISE, *Lord* RENDLESHAM, *and Mr.* BROGDEN.)

STOCKTON AND MIDDLESBROUGH WATER BILLS.

(*Continued from page* 690.)

Mr. *Bowman* recalled, and further cross-examined by Mr. BIDDER.

When the water company first got their bill, Stockton and Middlesbrough refused to join in. At that time Middlesbrough was a comparatively small place. Stockton opposed, not because the quality of the water was bad, but they alleged they had plenty of good water in wells, which were afterwards shown to be bad. I stated in my examination-in-chief that I believed we had invariably charged within our statutory powers.

Mr. BIDDER: You rather took credit to yourselves, I think, for having spent £5000 in hydrants.

Witness: I did not mean it in that way. The Mayor of Stockton made a complaint about the hydrants, and that led me to state that we had spent £5000 and never made any charge for them.

Mr. BIDDER: Did not the £5000 come out of the surplus revenue? It did not diminish your dividends,

Witness: For several years we divided less than we should have, but since we have got the arrears of dividends, of course that has been made up.

Mr. BIDDER: Do you know Messrs. Downey's iron-works?

Witness: Yes. They are a firm, I believe, who are outside our district.

Mr. BIDDER: Your own map seems to show that they are within your limits. They are at West Coatham, are they not?

Witness: I believe they are at Coatham. I think the district has been altered.

Mr. SOMERSET: I believe that Coatham is within the district of supply for domestic, but not for manufacturing purposes; that is at 3d. per 1000 gallons.

Cross-examination resumed: I believe Messrs. Downey consume a good deal of water. I believe they are not within the district. I cannot tell you whether or not it is a fact that they consume more than 5 million gallons, and that we charge them 5d. per 1000 gallons.

Mr. SOMERSET: I am prepared to find out what the fact is, if my friend thinks it material to his case.

Cross-examination continued: We supply the Corporation of Middlesbrough with a large quantity of water through about 63 meters. I do not think we charge on each separately; but we decline to charge them on the bulk. By that means, no doubt, they have to pay more, and no doubt that makes the expense of carrying out sanitary improvements greater. Some manufacturers have their water supplied by meter. I really cannot say what we charge for the meters; we get 12 or 13 per cent. on them. The company paint the meters, keep them in repair, and charge rent for them to consumers; the rent charged sometimes being £1. A meter costs £3 or £4, and it is preferable to charge £1 1s. a year instead of charging the cost, for if the tenant had a meter of his own there would be no security. I know a gentleman of the name of Bulmer, and I dare say we charge him £1 1s. a year for his meter. If we have not spent anything on it for 12 years, it is a very unusual thing. I think it is a rule that water companies do not allow people to buy meters; at all events our rule is to supply them. We should have no security as to having proper meters, if we did not keep them in our own hands. The charge to Mr. Bulmer is, I believe, 5s. 3d. a quarter. His consumption is very small—scarcely more than £2 a quarter. The charge for the meter would be no more if he consumed three or four times as much water. There never has been any charge made for the water supplied to the fire brigade, and I do not think we have refused to supply the necessary water for practice. Few people who are not connected with water companies know the difficulty of preventing waste. The railway company take a large quantity of water from us by separate meters in different cases; but the consumption in each case is very large. I believe we charge the railway company on their aggregate consumption, for this reason, that with three or four meters they will take a far larger quantity than the corporations. We refuse to give the corporations the benefit of their aggregate consumption for the reason I have stated. I object to the corporations having compulsory powers to purchase our works.

Mr. BIDDER: Do you object to sell voluntarily?

Witness: If by voluntarily you mean by arbitration, I do object. If you mean in an ordinary mercantile sense, I do not say I object.

Mr. BIDDER: What do you mean by selling in an ordinary mercantile way?

Witness: Asking for the value of what we have got. I might not be able to get my own price, but I should wish to avoid confiscation and spoliation.

Mr. BIDDER: Do not you know that several of the directors think it would be very desirable to transfer the company to the corporations?

Witness: I am not aware of it, unless they can get their own price. It is not true that several would have been willing to do it, but that one or two opposed.

Mr. BIDDER: Do not you know that there was a division in your council upon this very question?

Witness: No.

Mr. BIDDER: Do you mean to signify that some members of the board are not willing to sell on any terms?

Witness: I believe not. I have had the opinion of them expressed individually, and I do not think a single one of them agrees to sell by arbitration.

Mr. BIDDER: Was there not a division on the board on the question of sale or no sale, or as to the terms of sale?

Witness: Not that I am aware of.

Mr. BIDDER: Has Mr. Hawksley advised you to go farther up the river?

Witness: No.

Mr. BIDDER: Does it represent the views of your board to say that they have expressed a willingness, if Parliament said it, to go higher up the river?

Witness: No; it is not true.

Mr. BIDDER: Does it represent the opinion of your board that if a parliamentary committee said at once to you that you ought to go up to the top of the Tees and get better water you would do it?

Witness: I do not think that has been discussed by our board, nor am I aware that Parliament has expressed any opinion on the subject. If a parliamentary committee told us to go higher up the river for better or purer water, it is very probable that we should be prepared to do so.

Mr. BIDDER: Did not the Stockton and Middlesbrough Corporations say so last year?

Witness: They had not a scheme last year.

Mr. BIDDER: Had you not a bill last year for leave to pump more water out of the Tees, and did not the Corporations of Stockton and Middlesbrough oppose your bill, tooth and nail, because they said that was not the proper place to take the water from?

Witness: Yes, they did; but they had no scheme of their own. The corporations said last year we ought to go higher up, but we do not care a great deal what they say.

Mr. BIDDER: Did the committee say so, practically, by their decision?

The CHAIRMAN said there was no competing scheme last year, and it was hardly fair to ask the witness the opinion of the committee if it was not on the notes.

Mr. BIDDER said he wished only to show what the questions at issue were. The decision of the committee showed their opinion on those issues.

Mr. SOMERSET thought there would be disadvantages in the proposed course.

Cross-examination continued: The corporations opposed our bill last year, and so did the Tees Conservancy, and a lot of others. One allegation was that the quality of the water was bad, another that the abstraction of more water would injure the river. It was then asserted, as it has been this year, that we ought to go to the upper waters of the Tees for our supply. Mr. Mansergh was very likely examined with a view to show that a pure supply could be got from the Lune and the Balder. The Greta was also mentioned. It was only the opinion of the engineer for the corporations that the company ought to go somewhere else for the increased supply. That was one question at issue, another being about paying for the water. The committee said nothing more than that they were unanimously of opinion the preamble was not proved. We then asked for an unlimited quantity; but we now only ask for a small quantity. After that decision we did not take any steps to ascertain whether the plan for getting water from the Upper Tees was feasible, as we were satisfied with Mr. Hawksley's evidence that it was not, and we think so still. It is most unlikely the company will consent to the engineers consulting, so that the company and the corporations may agree on a plan for improving the water supply. If the committee say we must go up the Tees, it will depend upon the scheme whether we accept it or not. When Sir E. Beckett intimated that the company would go up the Tees if the committee said so, no doubt he expressed the views of the directors; but I cannot commit myself to saying that the board would go to the Lune and the Balder if the committee said we ought to do so. If the committee said we might pump 30 million gallons more per week from the Tees, on condition of making compensating reservoirs, I should think we would do that. If we went to the Lune and Balder, according to the corporations scheme, it would cost very much more than is proposed in their bill, though I believe that compensation water could be obtained for much less. If it was to cost £700,000, I do not know that we should ask 7 per cent. dividend on the share capital, but no doubt we should try for it. If the corporations raise it at 4 per cent., they would save 3 per cent., but they would waste more than that. I do not think it would make a difference of £21,000 per year to the consumers between the corporations and the company constructing the works. The Lune and Balder works would be no good without the existing works, or something like them.

By Mr. PATERSON: I have been about 25 years managing director, and have attended most of the meetings during the last year. Since last year we have not instructed Mr. Hawksley to reconsider the subject of bringing down the water from the upper part of the river. We came to the conclusion last year that the cost would be double what the corporations say, and are still satisfied that conclusion was correct.

By Mr. SHIELD: The Tees Commissioners object to our abstracting water from the Tees. They have deepened the bed of the river, and made other improvements. I have heard that an important element in keeping the depth is the scour of the fresh water from the upper part of the river, and I have no reason to doubt it. I do not think the quantity we take, or are about to take, makes any appreciable difference in the river further down.

Re-examined by Mr. SOMERSET: I know that the objection to going higher up the river is, that the ironmasters could not be supplied at 3d. per 1000 gallons if the cost of the new works were to be added. One objection last year was, that the company stole the water and then sold it at 3d. per 1000 gallons; and another was that there was no necessity for a further supply. The supply this year is eight or nine million gallons less than last year. There were three or four districts suggested which we should go to, and every imaginable thing was urged against the bill. It was said, if our bill passed, it would prevent the corporations getting the control of the water. The negotiations with the corporations last year resulted in nothing. We have never required to pump up to the limits of abstraction since the bill of last year. It was in the power of any person in Stockton or Middlesbrough to get our scale of charges if they wished. Mr. Watson said he had been refused, but there must have been some misapprehension about it.

Mr. BROWNE said those were only the rates entitled to be charged.

Re-examination resumed: They are the rates which we are entitled to charge, and also what we are actually charging. We do not charge our maximum. I do not believe we have charged the gentleman at West Coatham beyond the scale. We are not bound to supply water free for fire-brigade practice, although we have hitherto done so. We have a special agreement with the North-Eastern Railway Company, and they come under the five million gallons clause. I cannot tell what the corporations take, but they take nothing like the North-Eastern Railway Company, and it is from so many different meters. Some of the North-Eastern Railway Company charges are at 5d. per 1000, some at 4d., and some at 3d. The arrangement with the North-Eastern Railway Company was made 20 years ago, and has continued up to the present time. People sometimes tamper with meters, and it is necessary that whoever supplies the water should have control over them. Indeed, they have to be examined every week, and that costs money; besides which there are many other expenses in connexion with them, as they are liable to great injury, especially in winter time. Mr. Bulmer, who complains about being charged £1 1s. for meter-rent, only pays £2 a quarter for water. We cannot make a sliding scale charge for meters, but they are charged according to size. If the corporations got the water supply, they would have to keep control of the meters. We pay between £1300 and £1400 in rates to the Corporations of Stockton and Middlesbrough together. I substantially agree, individually, with what Sir Edmund Beckett said yesterday on the question of selling the works if there was a reasonable offer. If the committee give an intimation about going to another place for a supply, I know we would not get our bill unless we complied with it.

By the CHAIRMAN: On the lower-rated houses we deduct 10, and on the higher-rated houses 43 per cent., but I cannot give any reason for that being so. We have nearly £10,000 a year more profit than we can divide. Hitherto it has gone to pay the arrears of dividend. We have nominally a reserve-fund of £6000; but it has never been invested, as it has gone in expenses. We have to spend £10,000 over this bill. It is not so that we have a reserve-fund on the one hand, and a debt of £16,200 on the other; for the reserve-fund is only nominal. We must have more money, or we shall have to stop supplying water. We do not take power to supply Yarm. The Tees is very much deteriorated below our pumping-place, through the sewage from Darlington, &c., and it must be difficult for Yarm to get water. It is true that the corporations propose to supply it, and other places above Darlington; but they are not populous places. Staindrop has not a large population, but it is difficult to take the water there. I demur to the statement that the corporations water will be better, although a larger population will be supplied. I think there can be a better way of settling this matter than by arbitration, as I do not believe that arbitrations are satisfactory.

By the COMMITTEE: I do not think the quantity of the water has been complained of, and the complaints as to the quality I consider have been greatly exaggerated. The filtration has not been so good as it should be; but we have taken steps to remedy that defect, and we have plenty of land for filtering purposes. We require another reservoir, and all we want is that Parliament shall give us the necessary powers. Our complaint is that, after struggling for 25 years without dividends, our opponents should come down upon us, and want to wrest our property out of our hands. The amount of pollution in the Tees has been greatly exaggerated. I do not think it possible that any dividend can be paid on the large outlay proposed by the corporations, without imposing a heavy burden upon the ratepayers.

Mr. *T. W. Caraster* said he had been a surgeon in Middlesbrough for 18 years, and had never heard any objections either to the quantity or the quality of the water. During his practice there had been epidemics from time to time; but he attributed them to the state of the drainage rather than to the water. These epidemics were principally confined to certain parts of the town, the drainage of which was very much improving. In cross-examination he said he had always expressed an opinion that the water was good. He did not filter it before using it. It would depend on the amount of unhealthy sewage going into the water whether it would affect health. He should not think a small amount would affect the water; but it would be better without it.

Mr. *J. Ellerton*, a magistrate of Middlesbrough, said he was a member of the Royal College of Surgeons, and had been in practice in the town for the last ten years. The epidemic of fever in 1874 was confined to the north and west parts; but he did not attribute the outbreak to the water, but to the imperfect drainage, to the marshy nature of the ground on which the town was built, and to the miserable state in which the streets were kept. In 1875 there was another outbreak of fever, but not to any considerable extent. There was fever at the same time at Barnard Castle. Cross-examined, he said he was aware that about £90,000 had recently been expended upon the sewerage, and the health of the town had lately improved. The death-rate was 24 per 1000. He never filtered the water he drank, as he did not think it necessary, nor did he ever remember having recommended the use of a filter to any of his patients.

Mr. *J. Farquharson* said he had been in practice in Stockton as a doctor for about 18 years. He always drank the Tees water when he wanted it, and had always regarded it as a very fair water, as good as could be got for the town. He did not know that in Stockton in 1874 there was more than the average amount of typhoid fever. He seldom saw any disease of the bladder or kidneys, and this was an indication of the goodness of the water. He did not think the cases of typhoid fever they had had in the town could be attributed to the state of the water, but he had generally been able to trace them to defective drainage. In cross-examination he said he did not think the presence of sewage in water essentially produced typhoid fever, it would depend on the quantity. He thought it would be necessary to distil the water of the Lune and Balder to make it purer.

Mr. *John Mitchell*, examined by Mr. LITTLER.

I have resided at Barnard Castle for eleven years, and was a member of the Local Board of Health up to the time of my appointment as medical officer of health. The population of the town is 4025, and there has not been any increase of late, but rather the reverse. It is a healthy place, and there have only been two deaths from typhoid to my knowledge since I have been there. The bed of the Tees from Barnard Castle to Gainford is such that any sewage falling into it at Barnard Castle must be likely to become easily oxidized. I know no other river so favourable for oxidation as the Tees. There is no vegetable growth in it, and I think it is a river likely to be singularly fitted to furnish potable water. The exact number of privies that abut on the river there are seven on one side and two on the other. I have been frequently along the river, and never saw anything offensive, neither froth nor scum, as arising from fœcal matter. There must be some error in stating that there are from 50 to 100 privies overhanging the river.

Cross-examined by Mr. MICHAEL: The population of Barnard Castle has decreased since last March. There is an allowance in the summer time of nine gallons of water a head for the town, and in the winter we have a good supply. If sewage runs down this river 17 miles it will be oxidized. I do not know the normal quantity of oxygen in pure water, having never made any experiments on the subject. We have not had cholera at Barnard Castle in my experience. If there was such an epidemic there it would depend on the quantity of diseased matter going into the river, on the speed of the stream, and so on, as to whether it would be safe for the people of Stockton and Middlesbrough to drink the water into which the excreta flowed. If no more sewage went in than at present, and the circumstances of the river were the same as now, it would be safe.

Re-examined by Mr. LITTLER: A slow river does not oxidize water with sewage in it so well as a rapid river tumbling over a rocky and gravel bed. Even with an epidemic of cholera at Barnard Castle, with the rapid Tees running over a gravel bed, there would be no risk to Stockton. There is less sewage going into the Tees from Barnard Castle now than in 1870, owing to some of the sewers which were formed the wrong way, having been cut off, and besides this the population is less.

The evidence which the late Dr. Letheby gave on the company's bill last year was then read over to the committee.

MONDAY, APRIL 3.

Mr. *Dugald D. Campbell*, examined by Mr. SOMERSET.

I have been a consulting and analytical chemist for more than 20 years, and have had very great experience in the examination of water for domestic and other purposes. I have made analyses of waters from the Lune, the Balder, and the Tees. I have also examined the water supplied by the company from the Tees, and also that of the river Greta. I made my analyses last month, having received the samples on the 22nd of March. They are all soft waters, and there was no necessity for trying the hardness after boiling, although I did so. They were very much the same after that process; indeed, one of them increased in hardness after boiling. In the waters of the Lune and Balder, the solid matters dissolved are rather less than they are in the water supplied by the company. In the Lune there are 7·8 grains per gallon; in the Balder, 7·6; in the Tees at Stockton, 9·90; in the Greta, 8·0; and in the water of the Tees, entering the works, 12·40 grains per gallon. In that respect the Lune and Balder are rather better than the company's water. The organic matter is higher in the Lune and the Balder than in the Tees at Stockton and Middlesbrough. In the Lune and Balder the organic matter is ·80 grains; in the Tees, entering the works, ·70; the Tees at Stockton, ·60; at Middlesbrough, ·50; and the Greta water, 1·20. That shows the superiority of the company's water over the Lune, Balder, and Greta, as containing less organic matter. The Lune and the Balder are rather less hard than the water at Stockton and Middlesbrough, but both the dissolved matters and the hardness are of comparatively little importance in waters of this description. I consider the objectionable matters in water are ammonia and ammoniacal salts, and the company's water compares favourably with the Lune and Balder in that respect. The water entering the works contains rather less nitrogen as nitrates than the Lune and Balder. The Greta also has a very slight change. Chloride of sodium is generally considered a very important item in water that is used for domestic purposes, and it very often indicates sewage contamination. If sewage is found very largely in water it is looked upon with suspicion. Some of this water shows a slightly larger quantity of chloride of sodium than other waters do, but it really is not in excess. The Tees and the Lune are exactly similar in this respect, but the Tees is far better than the Balder. That may be accounted for by the filtration. I attach a great deal of importance to the £12,000 being laid out in filter-beds. The Middlesbrough water is better than that at Stockton with regard to the chloride of sodium. The quantities in either case are not such as one would attribute to sewage in any large amount. I think this water is an excellent water for domestic purposes.

The CHAIRMAN: Will you explain how it is that your report shows the water at the pumping-station so much harder after it has been boiled than before?

Witness: Very often Tees water, when boiled, becomes hard. It is impossible to say exactly how that takes place.

Sir JOHN DUCKWORTH: I see that, in one respect, you show the water, where it enters the company's works, to be better than it is after having passed through the filters. How do you account for that?

Witness: I cannot explain it; it may arise from the state of the filters. The difference is of very little consequence, but still there is a difference.

Examination resumed: The oxygen in the Tees water compares favourably with that of Loch Katrine, as reported upon by the Water Commissioners in their first report. In Loch Katrine it is ·704 in 100 cubic inches; in the Tees water I find it to be ·84. The presence of oxygen indicates that there is no sewage contamination. So far as the comparison goes in that respect, Tees water is a shade better than that of Loch Katrine, but not enough to talk about. I have looked up the reports by the commissioners as to the state of the water in a few towns. Bradford has not so good a supply as Stockton or Middlesbrough, nor has Halifax, Newcastle, Leicester, Crewe, or Wolverhampton. From the organic matter, which determines the impurity of water, they are all less pure than the water of Stockton and Middlesbrough. With regard to Dr. Frankland's views, I have that gentleman's evidence before me, but I do not agree with his opinion that the sewage discharged into the river at Barnard Castle would arrive at the pumping-station in almost the same state. I have read all his evidence, and I dissent from his views as to the oxidation of water. I know the Tees, but not for the purposes of this investigation. My view is, that any sewage entering the Tees at Barnard Castle would, by the time it arrived at the pumping-station, be oxidized to such an extent as to render it perfectly innocuous.

Cross-examined by Mr. BIDDER: The oxidation of water depends upon the quantity of sewage that goes into the river, upon the quantity of water that it meets, and upon the amount of what I may call friction, or knocking about, which it gets before it arrives at the point at which it is taken for consumption.

Mr. BIDDER: Would river water, into which a substantial contribution of sewage has been thrown, be satisfactory for drinking purposes after a flow of 15 or 16 miles?

Witness: If that sewage were met by water of 500 times its volume, and flowed down as far as this water does, it would be perfectly satisfactory water to drink, as far as its oxidation is concerned.

Mr. BIDDER: If the proportion of water were about half that—if it were about 250 times the bulk of the sewage—would you be prepared to drink it?

Witness: Yes, I would, if it were pure sewage; though that amount approaches a limit below which I should not care to go.

Cross-examination resumed: I believe the flow of the river at the time I made my analyses was about 40 or 50 million gallons. I do not know anything of the circumstances under which the samples were taken. If these samples were taken at the time the river was running full, it would be no guide as to what the result would be if they were taken at a time when the river was low, and the proportion of water very much less. If there is sufficient oxygen in the water, I am not afraid of some sewage in it. I do not think that particles of animal matter, which had not been decomposed, would escape my analysis for ammonia, nitrates, and nitrites. Nitrates are not always signs of the presence of sewage, for rain, as it falls from the heavens, contains nitric acid. I do not agree with the report of the Rivers Pollution Commissioners, that there is no river in the United Kingdom long enough to oxidize sewage completely, and make the water pure. My tests give a good indication of whether sewage is present in the water, and the extent of the injury likely to arise from organic matters in the water. I do not know to what to attribute the ammonia in the Lune and Balder waters, if not to animal sewage. The presence of ammonia and ammoniacal salts is not compatible with the absence of animal sewage. It may, to a certain extent, arise from peat, the waters of the Lune and Balder being peaty. Dr. Frankland found no ammonia or nitrates in the Lune and Balder, whereas I did. We probably did not analyze in the same way. I burnt the residues until there was no more loss of weight; but I do not know that that method has been discarded by most chemists now. The samples taken were from the junction of the Balder with the Tees, below Cotherstone, but I should have thought it better to have taken them where the corporations reservoirs are proposed to be built. If you can store the water in subsiding reservoirs and draw it off colourless, it will be an advantage. Sewage is to a great extent a means of propagating typhoid fever and cholera; at the same time I think those diseases often arise from the gases from the sewers. I know of no chemical test that will detect the presence of the germs of disease. I should like to know what the germs were, and how they behaved before being put in, and then I might test for them, as no doubt they exist.

Re-examined by Mr. SOMERSET: I never saw a germ, and never saw any one who has seen one. No one is able to say that a certain germ would do a certain thing, and would not do another thing. I have had great experience in the treatment of sewage, but know only three or four gentlemen in the profession who adopt Dr. Frankland's mode of analysis for sewage. Even Dr. Frankland makes out there is no previous sewage contamination at Tees Cottage. I found traces of previous sewage contamination in all the samples I analyzed.

By the COMMITTEE: If the germs exist, they are more likely to be communicated if the rate of filtration is excessive, such as 50 per cent. more than the proper rate. There is a difference between fresh and putrid sewage, and where there is sewage from cholera patients, it can be removed by the atmosphere and oxygen, just the same as other sewage. Dilution and aëration meet every case, in my opinion.

Mr. *H. Walker*, one of the water company's clerks, said he was instructed to take samples from the Lune, Balder, and Tees every week, from November, 1875, to March, 1876. The Lune samples were taken at the Lune Bridge, the Balder samples just above Cotherstone, and the Tees samples above the pumping-station. He also took samples from the Stockton and Middlesbrough taps. He sealed all the samples up in bottles, and brought them to Mr. Campbell, in London.

Mr. *Thomas Spencer*, examined by Mr. SALISBURY.

I am an analytical chemist, and have practised more than 25 years, during which time I have paid a good deal of attention to the analysis of water. I am a member of the Chemical Society, and for some years was the adviser of the Corporation of Liverpool and the New River Company. I know the Tees, but have not examined it for water supply, except the samples sent to me. In 1872 I analyzed a sample from the Tees above the pumping-station, and the result was that I found no unwholesome ingredient, nor any animal sewage. The water was clear, and good for a town supply. I believe that analysis was made in opposition to the company. I reported that the sewage of Barnard Castle would be thoroughly oxidized long before it arrived at the company's pumping-station. I have made many experiments, which show that sewage is oxidized in a much less distance than that from Barnard Castle to the Tees Cottage. The oxidation varies according to the state of the atmosphere; and in the Tees the small quantity of sewage would be rendered harmless. Sewage would be oxidized more rapidly than organic matter from fresh vegetation. Nothing is more difficult to get rid of than the soakage of vegetable matter, whereas sewage matter appears to be always ready to be taken up by the atmosphere. It is a process of combustion, the same as in a fire, and the rotten matter of sewage is more readily oxidized than the soakings of fresh vegetation. This is not a hasty opinion, but the result of experiments I made both before and since Dr. Frankland's reports. I have examined, for the purposes of the present bill, all the samples of water sent from Middlesbrough. The total solid matter per gallon was 8·050 grains. I believe there was not much discrepancy between Dr. Letheby's analysis and my own. I did not search for ammonia, and I never do, for it is no indication of sewage matter in any shape or way. I agree with all that Mr. Campbell has said as to the substantial quality of the water. I can see no objection to the water supplied by the present company, for it is very good indeed. It is taken 16 or 17 miles below Barnard Castle, and after that run down the Tees, I should say that no trace of sewage could be found in it. I have seen the stream, and know there is a good deal of gravel with ferruginous matter in it, which helps to oxidize organic matter. I know an instance where a four-mile run has taken away the sewage matter from water, but then the circumstances were peculiar. The instance I refer to was in connexion with the Liverpool works, before they were finished. I found that with the sewage from the privy of the Free School, in the proportion of 1 in the 1000, four miles had been sufficient to oxidize if not all, the greater part of it; for nitric acid was found at the end of the goit, which was a sign that oxidation had taken place. The flow was about a mile and a half an hour. If nature were not to make that provision, it would be impossible to use the water, and the sea itself would become a vast cesspool. The amount of solid constituents in the sample of Tees water I analyzed in 1872 was 13·43 grains. In 1876 it was 8·50, a difference of five grains in a gallon.

Cross-examined by Mr. VENABLES: If there were no filters at the works I should expect the water to be more coloured at Middlesbrough than at the intake, if the water were soft; but I should expect to find the analysis the same. Any difference in the analyses at the intake and at Middlesbrough must be due to the filters. I cannot give any other cause that would make the difference. Mr. Campbell attaches more importance to ammonia than I do, but I agree with him in general. The nitric acid would probably be ammonia at the commencement, but otherwise I do not give ammonia in my table. There is a difference between my analysis of 1872 and that of 1876, which may be attributable to the filters, the 1872 sample being taken from the Tees, above the pumping-station, and that of 1876 from the Middlesbrough taps. I cannot give any other reason than the filters for the difference in the various salts; but the water might be softer in the one case than the other. I distinguish animal from other organic matter by the presence of nitrates and phosphorus. When we find nitric acid in town wells we set it down as being from contiguity to graveyards, cesspools, or something of that sort. In the Lune and Balder samples, the organic matter would be vegetable, as I found very slight traces of nitric acid. There has been so much rain lately, that we are likely to have softer water in 1876 than in 1872. I should say that the weather was dry in 1872, as compared with 1876, therefore, if these samples had been sent to me when the river was low, almost all the items would be higher than they appear in my analysis, but that would not affect the hardness so much. I think the opinions I have stated here are held by the majority of chemists. I agree with Sir Benjamin Brodie that ordinary oxygen does not oxidize at all, but when it is mingled with ozone it oxidizes very rapidly.

By the CHAIRMAN: I have frequently tested water in reservoirs, but have not found an appreciable change in it in a month. There is nothing injurious in peaty water. I do not think the peaty matter is ever in suspension, but always in solution. I know the Loch Katrine water, which is not so free from colour as the London water; in fact, I know of no soft water that is free from colour. When I took the Middlesbrough water, I thought that the colour was such that no one would object to drink it. The waters of the Balder and Lune are not so pure as that of Loch Katrine in colour, nor would the use of settling-ponds make any practical difference in that respect.

Mr. *Alfred J. M. Edger*, examined by Mr. SOMERSET.

I live at Newcastle-on-Tyne, and am public analyst for the county of Durham and the borough of Gateshead. In March, 1875, I examined the reservoirs of the water company with Dr. Letheby, but made my analyses separately from him, yet they agree in results. I took the whole of the water from Middleton-in-Teesdale to the point of intake, examining eight or nine samples. I looked at the river so as to give evidence upon the question, and found that no sewage flows into it except at Barnard Castle. In company with Dr. Letheby, on the 8th, 9th, and 10th of March this year, I made a visit to the Tees for the purpose of analyzing the water. We took samples from the Lune and the Balder, which were in a state of flood the first two days, but on the third day there was not quite so much water. I analyzed the samples with Dr. Letheby, and there is no material difference between that analysis and Mr. Walker's, although there is a certain amount which would be accounted for by the different state of flood. The total amount of solid matter per gallon is nearly the same. There would be a natural difference, from the fact of the experiments extending over several months in the one case, and only covering two or three days in the other. In 1875, when I made my experiments, the water from the river was slightly turbid, but the samples taken from the reservoirs were bright.

Cross-examined by Mr. BIDDER: There is a difference between my analysis and that of Mr. Campbell in regard to saline ammonia. His result shows 14 times as much as mine, but that would be accounted for by the difference in the samples. I should not attribute it to the chemists, as it would be impossible that they could differ so much upon the same samples. I am not aware that there is a great difference between my analyses and those of Dr. Letheby and Mr. Campbell. I do not know what the flow was at the time that my samples were taken from the river. Of course the pollution would be at its maximum when the flow was at its minimum. The river was low when I took my samples in March, 1875, and I have never taken samples in the summer time.

Re-examined by Mr. SOMERSET: I believe the samples that have been referred to by the other side were taken in March, at the same time as mine were. I do not think the difference between my analysis and Mr. Campbell's is material. I think this water is an exceedingly good water.

Mr. *John T. Wade*, examined by Mr. SOMERSET.

I was formerly consulting chemist to the Royal Agricultural Society, a member of Lord Essex's Commission, and of the first Rivers Pollution Commission. In conjunction with Messrs. Spencer and Campbell, I have examined the Tees, and am of opinion it is undoubtedly good water for domestic purposes. My view as to the water supplied by the company is, that it is perfectly good, and that there is practically no difference between the Tees and the Balder and the Lune; but, if I were to make a distinction, it would probably be in favour of the Tees water. The colour of the Balder and Lune water is not so good as that of the Tees, but this may be attributed to peaty matter. My analysis, in my opinion, truly represents the contents of the water. I do not use Dr. Frankland's method, though I have a great respect for him as a very able and conscientious chemist. I cannot use his method, for, without disrespect to him, I may say I think it is beyond the capacity of any ordinary chemist to use it. I cannot agree in the opinion that Dr. Frankland expressed in his evidence—that no difference would be made in a flow of 16 miles as regards oxidation of sewage. The effect of that would be, that no flow could make any difference. Taking into account the distance of 16 miles, and that the bed of the river is rocky and the flow rapid, I believe a great deal of difference would be made in the sewage before it got down to the intake. I should say that it would then be almost innocuous.

Cross-examined by Mr. MICHAEL: Before solid matter can become a ferment, it must be dissolved, and the active portion of sewage I take to be the solution. In some streams, if visibly thrown into the water, I could trace sewage down for some miles; but, after a time, I should lose sight of it altogether, and be unable to detect the presence of the matter. It, however, might still be there, although chemical science failed to detect it. I have heard of cases of typhoid fever generated spontaneously; but the more general opinion at the present time is, that it is caused by impure water. In very foul water there is no oxygen at all; but I made no test to discover whether there was any in this water. I do not agree with Mr. Spencer in leaving out of his analysis the item of ammonia, and none of his figures represent ammonia or ammoniacal salts. His analysis is such as would have been the only one available a few years ago. Dr. Frankland has, however, instituted another method, which enables the chemist to get at a more exact analysis. I should consider the most important items relative to organic matter to be those showing the ammonia and chloride of sodium. I cannot say whether Mr. Spencer's analysis shows any distinction between organic animal matter and organic vegetable matter. I believe that many chemists adopt Dr. Frankland's method, although it is exceedingly difficult. I should say that none but a very accomplished chemist could carry it through.

Re-examined by Mr. SOMERSET: My analysis correctly describes the character of the water. If there is any difference between the water of the Tees and of the Balder and Lune, it is in favour of that of the Tees.

(*To be continued.*)

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, APRIL 25.

(*Before the* MASTER OF THE ROLLS.)

THE CORPORATION OF BIRMINGHAM *v.* ALLEN AND HOLDEN.

This was a motion to restrain the defendants from working their mines of coal in such a manner as to cause the subsidence of certain lands under the control of the corporation.

Mr. CHITTY, Q.C., and Mr. INGLE JOYCE appeared for the corporation; and Mr. INCE, Q.C., and Mr. SPEED appeared for the defendants.

Mr. CHITTY, Q.C., said that the plaintiff corporation apprehended that considerable damage would be done to certain gas-mains if the defendants continued working their coal mines in the manner they had hitherto been doing. The other side had put in a plan, on which there was a dotted line showing a point beyond which it was agreed, on all sides, that the defendants had no right to carry on their mining operations. The engineers on both sides might be able to agree on some common line beyond which the defendants should not work, and if the usual undertaking were given by the defendants, he would ask that the motion should stand over until the next motion day; the undertaking to be without prejudice.

Mr. INCE suggested that the motion should stand over until the hearing. His lordship would find that in this, as in most mining cases, there would be a great many points in dispute, and the evidence of scientific witnesses would also be found to be in conflict.

Mr. CHITTY: To a certain extent, this case is speculative. If any common line can be agreed upon by the parties, it might perhaps be as well. The corporation, of course, desire to protect their gas-works.

After some further discussion, it was arranged that the motion should stand over for a week, the defendants to file their affidavits in the meantime.

FRIDAY, MAY 5.

Mr. CHITTY said his lordship would remember that this motion was mentioned to him the previous week, and that it then stood over on an understanding being given by the defendants not to carry on their mining operations beyond a certain line, and in such a manner as to damage the gas-works belonging to the plaintiff corporation. A great deal of damage had been already done to the corporation gas-works. The plaintiffs did not agree to abide by the line previously agreed to as the permanent line beyond which the defendants should not carry on their operations; and at bar he only agreed to the said line, in order to keep things *in statu quo*. He now applied that this arrangement should be continued without prejudice to any question which might arise, and also that liberty should be given to apply, should any further damage be done.

Mr. INCE, who appeared for the defendants, made no objection.

His LORDSHIP said that the arrangements could be continued without prejudice to any question, and that the plaintiffs would be at liberty to apply should any further damage arise. The corporation undertaking to be continued, and the costs to be costs in the action.

GUILDHALL POLICE COURT.—MONDAY, MAY 8.

(*Before Alderman Sir* T. DAKIN.)

USING IMPURE WATER.

Major *Weiland*, of Queen Victoria Street, appeared to an adjourned summons, taken out by the Commissioners of Sewers, charging him with having on his premises a well for domestic purposes which was impure and totally unfit for household use.

Mr. BAYLIS appeared for the Commissioners of Sewers; Mr. C. M. ELBOROUGH represented the defendant; and Mr. GEORGE DEBENHAM watched the case for the New River Company.

Mr. BAYLIS said that on the last occasion it was shown that Major Welland was the owner of several very fine blocks of buildings in Queen Victoria Street, and to supply them with water he had sunk wells under them. The water from those wells, however, was impure, and not fit for household purposes, and on that coming to the knowledge of Dr. Sedgwick Saunders, the medical officer of health for the City, he had taken great pains to analyze it. On the last occasion the case was adjourned for Major Welland to have it analyzed on his own behalf, and he was now convinced that it was unfit for domestic purposes. He had acted in the most honourable manner, and was prepared to give his guarantee that the water from those wells should not be used for drinking purposes. Under those circumstances, he wished to withdraw the summons.

Dr. *Sedgwick Saunders* said that his experience of the well-water of London was, that it was so impregnated with organic matter, as to render it unfit for

cooking or domestic purposes. It would be well for all gentlemen who were building in London, and thought of sinking wells, to know that fact, as they might be saved considerable sums of money. The result of his analyses was that he found the water very variable; but in any circumstances it was so impregnated with sewage as to be unfit for domestic use. He had made four analyses of the water which he had taken from Major Weiland's well. The average result showed that it contained 99·1 grains per gallon of solids, against 17·0 of the water of the New River Company; 9·2 grains per gallon of chlorine, against 1·2 of the New River water; 8·20 parts per million of ammonia, against 0·03 of the New River water; and 1·9 of albumenoid ammonia, against 0·06 of the New River water. It was important that the public should know, that in consequence of the number of burial-grounds in London, and the sewage, all the subsoil was so impregnated with impurities that they must permeate into the wells, and render the water unfit for domestic use.

Sir THOMAS DAKIN asked whether those remarks applied to the whole of the Metropolis, or if he could point out any good wells.

Dr. *Saunders* said he believed it applied to the whole of the Metropolis, but he wished to confine himself to his district—the City of London.

Mr. DEBENHAM said that he was requested by the Board of the New River Company to attend the Court, in consequence of what was said there on the previous Monday with regard to their water supply, and the price they charged for it. He was instructed by the Board not to take any part in the proceedings, except to say that the statements made on Monday were not correct. Major Weiland would not have had to pay so much as £1000 a year for water.

Mr. ELBOROUGH said that what Major Weiland said was, that it would cost him £1000 to alter his premises so as to take the water from the New River Company.

Sir THOMAS DAKIN asked whether Major Weiland was prepared to give the undertaking not to use the well water for drinking purposes; and on a reply in the affirmative being given,

Dr. *Saunders* withdrew the summons.

Sir THOMAS DAKIN said it was a very proper termination of the case, and Mr. Debenham had attained his object.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board on Friday last—Sir JAMES HOGG, M.P., in the chair,

The Parliamentary Committee made a report, in which, speaking of the Metropolis Gas Companies Bill, they remarked—"Your committee further report, for the information of the Board, that the bill introduced into Parliament by the Board and the Corporation of London for the regulation of the Metropolitan Gas Companies was read a second time in the House of Commons on Tuesday, the 9th inst."

Mr. DRESSER ROGERS thereupon rose and said, with regard to the gas question, a most important letter had been received from the Board of Trade, the contents of which, he thought, ought to be communicated to this Board at once. As he understood it, that letter contained proposals which altogether altered the conditions under which the gas companies, especially those on the south side of the Metropolis, were to be legislated for, and he thought it was the duty of the Parliamentary Committee to report that letter to the Board. As they had not done so, he should move that the letter be now read. He was surprised that the Parliamentary Committee had kept back so important a communication.

Mr. LEGG seconded the motion.

Mr. ROCHE (chairman of the Parliamentary Committee) said there had no letter whatever been received by the committee. A communication had been made by Mr. Farrer, the permanent secretary of the Board of Trade, to Sir James Hogg on the subject. That communication contained certain suggestions upon which it was desired to obtain an expression of the opinion of this Board.

The CHAIRMAN: No; of the Parliamentary Committee.

Mr. ROCHE said the letter had been sent by the chairman to the Parliamentary Committee, who had met that morning to consider it. In the result, they came to the conclusion that they would refrain from expressing any opinion upon the terms of that letter (beyond saying that they did not meet their views), until they had had an opportunity of conferring with the gas companies and with the Board of Trade. If the Board desired to enter upon a discussion of the question at the present moment, he had no objection whatever; but he understood it to be the opinion—the unanimous opinion—of the Parliamentary Committee that it would be better, first of all, that such a conference as he had mentioned should take place. The committee had no power to bind the Board to anything at such a conference, but they would afterwards bring up a report, stating their views upon the matter, and asking for the decision of the Board as to the course they should adopt. He was sure the members present would agree with him that, when a Government department made a communication to the chairman of the Board, desiring that certain negotiations or conferences should take place, it would not be wise to make that letter or communication the subject of a public debate. Personally, he had no objection whatever to having the letter read; but the committee considered it was not expedient until after the conference had been held. Nothing would, in the meantime, be done by the committee binding upon the Board; and, therefore, it was the express wish of the committee that no report upon the communication of the Board of Trade should be brought up that day. If the letter was read, it would no doubt lead to a long discussion, and it would, after all, come to this—that the Board would have to leave the matter in the hands of the committee to consider and report upon; because he was sure that they would not attempt to lay down any line of conduct without first referring it. As he had already said, the committee could do nothing to bind the Board in the interval; and, therefore, it would be wise to allow the interview to take place between them and the companies and the Board of Trade before publicly debating the question. Let it be remembered that the bill promoted by the Board had passed the second reading. The committee had come to the determination that they would not concede anything, or even confer with the companies, until after the second reading had taken place. When the conference had been held, the committee would report the result to the Board.

The CHAIRMAN said he entirely concurred in the opinion of the committee that it was not expedient to discuss the matter now; and he hoped and trusted that his colleagues would not insist upon having the letter read. He thought it would be most inconvenient that a letter addressed to the chairman by a public department, inviting a conference with a committee of this Board, should be publicly read and discussed before the conference had taken place. Such a proceeding might put a stop to any negotiation which would otherwise be possible.

Mr. DRESSER ROGERS rose to speak, but

The CHAIRMAN ruled him out of order, as he had already spoken.

Mr. DRESSER ROGERS said, to be in order, he would move the adjournment of the Board.

The CHAIRMAN said he could not allow that to be done. The honourable member had already moved that a certain letter be read. Upon that a discussion might take place, and he would be entitled to a reply. It was clearly, therefore, out of order for him now to move as an amendment that the Board adjourn. The motion had been seconded; but he sincerely hoped that the Board would not require the letter to be read.

Mr. DRESSER ROGERS said the letter had been already published in the JOURNAL OF GAS LIGHTING.

Sir W. CODRINGTON said he would avoid entering into the merits of the case; but he thought it right to say that, in his opinion, when a communication was addressed to the chairman of the Board, which he considered so important and of so confidential a character, that it should not, in the interests of the public, be read, that fact, at least, ought to be stated, and the Board itself should make the reference to the committee. Here was a letter handed over to the Parliamentary Committee for them to report upon, the contents of which the Board knew nothing about.

Mr. RICHARDSON differed from the opinion expressed by the chairman. He knew the contents of the letter in question, and admitted the importance of the questions involved; but, as a matter of principle, he contended that a communication from a Government department ought not to go to a committee for consideration without being specially referred by the Board. Apart also from the question of principle, he doubted very much whether any harm could come from publicly discussing the letter at that time. It seemed to him a little out of place for an important committee to enter into negotiations (for that was what it would come to) without special instructions from the Board. After that, they would have to come up with a report, and ask that the course they had adopted should be approved.

Mr. H. L. TAYLOR said the chairman of the Board had their entire confidence with regard to any correspondence that might take place between him and a Government department. The question now was whether the letter, referred to in the motion, was a private communication or not. If it was not private and intended to be kept so, it ought to be read to the Board. As he understood, the letter was already in print.

Mr. DRESSER ROGERS: Not the letter itself, but the gist of it is in print.

Mr. H. L. TAYLOR remarked that if the letter was private it would not be wise to have a discussion upon it, but it had better go to the committee. At the same time it must be understood that the committee had no right to compromise the Board in any action they might take upon it, but all their negotiations should be subject entirely to the decision of the Board, who must be guided by their own judgment in the matter. It must be clearly laid down that, in whatever they did, the Parliamentary Committee did not pledge the Board; their duty was to get all the information possible from the gas companies and the Board of Trade, and report it to this Board with any recommendations they pleased. The Board must have confidence in the committee to that extent, and then decide what, in their opinion, was the best course to adopt in the interest of the public.

Mr. LEGG said he seconded the motion for this reason—that he found from the *agenda* of the Parliamentary Committee that day that their business was to further consider a letter from the Board of Trade, transmitting copy of proposals submitted to them by the London, Phœnix, and Surrey Consumers Companies, with regard to the Regulations Bill, and requesting to be informed of the views of the Parliamentary Committee thereon. Now, in his opinion, the views of the Board, which might possibly differ from those of the Parliamentary Committee, were the views that should be communicated to the Board of Trade, and it was to elicit those views that he supported the proposal to have the letter now read.

Mr. SELWAY quite agreed in the general principle that letters addressed to the chairman of the Board were not necessarily letters to be read publicly at the Board; but letters addressed to a committee of the Board, asking for their opinion, stood upon altogether a different footing. The committee, indeed, as such, could have no opinion apart from the Board, who delegated matters to them, and therefore he considered that the letter ought to be read. The honourable member for the City (Mr. H. L. Taylor) said the Board must have confidence in the Parliamentary Committee, inasmuch as they could not or would not act without first reporting to the Board. But he (Mr. Selway) thought it extremely probable that they would adopt a different course, and he wanted to guard against their doing so. Many things had been done by the Parliamentary Committee without waiting for the sanction of the Board, and when the inquiry was made why they had done so, the Board were informed that the haste with which parliamentary business had to be conducted necessarily prevented them on these occasions from first reporting to and getting the sanction of the Board to their proceedings. Probably the Board would be told next Friday that it was of the greatest importance to answer the letter of the Board of Trade before this Board could meet, and, therefore, there would be no opportunity of expressing an opinion upon the important questions at issue. If, therefore, it was likely a reply was required before next Friday, the letter should be read and discussed at once.

Mr. FREEMAN said the object of the Board was to carry the bill they had promoted this session, or to obtain all the objects of that bill in some other and better way if they could. Under these circumstances, and assuming that no alteration was to be made in the principle of the bill, the Board should have some little confidence in their chairman, who had conducted the bill to its present stage in Parliament, and in the committee who had hitherto been watching its progress. The whole question was, how could the object they had in view be best effected, whether by the bill now in the House of Commons, or by negotiation and arrangement, without having to fight a very expensive and very hazardous battle. Surely there could be no harm in trying to do it without fighting; and if they could do so, it would be very satisfactory. If it could not be done by negotiation, the committee would report that fact to the Board, who would then be entitled to go on with their bill. If the Board could not trust the Parliamentary Committee and the chairman in these negotiations (which, after all, would not commit them to the course that might hereafter be recommended), he was afraid their prospects of a successful termination of the matter were not very promising. He hoped, therefore, that so much confidence would be manifested in the committee as to entrust them to see whether, by negotiation, the desired object could not be fully carried out, without the risk and hazard of going on with the bill—because it must be borne in mind that, if they did not listen to the Board of Trade, their case would be materially weakened.

Mr. RUNTZ said the Board, upon his motion, determined to go on with the Regulations Bill, and the Parliamentary Committee had no power to depart from the terms of that resolution. This fact ought to be sufficient to satisfy members that there was no danger of the Board being committed to a course which they would hereafter disapprove by any negotiations into which the committee might enter with other parties. While the committee were bound, by the resolution of the Board, not to depart from the principles of the bill, they were not precluded from conferring with those who said that the same object might possibly be obtained without pressing that bill through Parliament. No action would be taken by the committee, but at the next meeting of the Board a report would be brought up from them as to the result of the proposed conference. What harm could there be in waiting till then? This was a matter of far greater moment than appeared at first sight. Committees were appointed by the Board, and they sometimes had delicate duties to perform, and if by such questions as those put by the honourable member it was implied that they were not to be relied upon to discharge those duties faithfully, it would become difficult to find gentlemen willing to undertake the onerous duties cast upon them. He (Mr. Runtz) happened to be a member of the Parliamentary Committee, and he could say for his colleagues what he could say for himself individually, that they would not take any step which they did not believe the Board themselves would take, had they known all the

circumstances from the first. In the present case they would pledge themselves to do nothing—in fact, they could do nothing—until they had reported to the Board. If, as the result of negotiations, they could bring up a report and say, "Pursue the course we recommend, and you will save £5000 or £6000 while obtaining all the objects of your bill," they would feel that they had done their duty.

Mr. FOWLER said, if what the last speaker had stated was the fact, there could be no objection to the course suggested; but the circumstances of the case were peculiar. A committee of the Board were asked by a letter from the Board of Trade to express their opinion on so delicate a question as the terms upon which the bill promoted by the Board should be withdrawn, and certain gas companies were to be legislated for; and he, for one, was afraid that the Board would be committed morally, if not legally, to a course of action before the results of the negotiation could be submitted for approval. The interests at stake were so large, and the question had been thoroughly discussed by the Board, certain principles having been laid down upon which they had determined to act, that he felt they ought not now to give power to any committee to do anything without first communicating it to, and obtaining their assent. What was the object of the letter being addressed to the chairman? If the terms of the Regulations Bill were to be applied to the companies on the south side of the Thames, as they had been adopted on the north side, what necessity for a conference? But if the bill was about to be altered at the suggestion of the Board of Trade, so as to secure their assent to its further progress, surely that ought to be reported to this Board.

Mr. LLOYD did not agree with Mr. Richardson, that no letter should be considered by a committee until it came before the Board.

Mr. RICHARDSON: I said, until referred to them by the Board.

Mr. RICHARDSON differed in opinion on that subject, and said that if such a course had been adopted two years ago in reference to the Building Act Bill, the progress of that measure would have been very much retarded. His own feeling was that, if the Board now came to the conclusion that the Board of Trade letter should be read, it would be very injurious.

The CHAIRMAN said ever since he had been chairman of the Board, it had been his practice, when a letter was addressed to him on a question already referred to a committee, to hand that letter to them. It would be simple folly to bring such communications before the Board, and the committees would never be able to fulfil their duties. The Parliamentary Committee, during the session, had most important duties cast upon them, and very frequently had to act on the moment. On the present occasion, there was no necessity for them to do so.

Mr. DRESSER ROGERS said under ordinary circumstances he should be inclined to adopt the suggestion, but it must be remembered that the Board had agreed to a bill for regulating the gas companies, which, at the present time, had been read a second time in the House of Commons. It was a bill, in the promotion of which the Corporation had joined with them; and now, after the second reading, they were called upon to upset the entire principle of the bill. (No, no.) In 1874 the Board passed the strongest resolution they could pass against amalgamation, and their bill was particularly directed against it. They had spent thousands of pounds in opposing that principle, and now they were asked to sanction it. He knew the contents of the letter from the Board of Trade, but he would not refer to them, because he did not wish to go against the feeling of this Board. It was a most important letter, and ought not to be consigned to the limbo of a committee. It affected the whole of the south side of London——

Mr. LLOYD: I rise to order. This is not the question before us. We are not upon the merits of the letter, and we are assumed not to know anything about its contents. The question is, shall that letter be read?

The CHAIRMAN: The honourable member, Mr. Lloyd, is certainly right. The only question is whether the letter shall be read, and Mr. Rogers must not go into the contents of it.

Mr. DRESSER ROGERS: I was not going into it. I was simply going to show the great importance of the communication to my district. It will cost us thousands of pounds——

Mr. LLOYD: I again rise to order; this is not the question.

The CHAIRMAN: The question of order is put to me, and I must decide it. I repeat what I said before, the question before the Board is, shall this letter be read now. The honourable member must confine himself to giving reasons why the letter should be read, and must not go into other matters, of which he may be cognizant, but of which other members are not.

Mr. DRESSER ROGERS: The Board have passed a resolution to promote the Regulations Bill, which contains certain provisions affecting the supply of gas in the Metropolis. The larger portion of these have been adopted by the Chartered Company; but now a Government department steps in and says, though the question is settled as far as the north of London is affected, yet so far as the south is concerned—— (Order.)

The CHAIRMAN: If the honourable member carries his motion to have the letter read, he can go into these details. At present, the Board have not agreed to it.

Mr. DRESSER ROGERS: I distinctly understood that the letter would be brought before the Board, and was quite surprised when the chairman of the committee said it would not be read. However, I must bow to your ruling. I am given to understand that our bill has been read a second time and referred to a select committee, which will meet on Tuesday next.

The CHAIRMAN: No; it has been read a second time in the House of Commons, and, being a hybrid bill, it will be referred to a select committee. But I am going to address a question to the Prime Minister to-night, to know what facilities he will give me in the further progress of the matter. After that I must confer with the authorities of the House, and I certainly shall defer any action until Monday, when I shall consult my colleagues here as to the best course to pursue. The other Metropolis Gas Bills, being private bills, have been referred to a committee, of which Mr. Walter, the member for Berkshire, is the chairman.

Mr. DRESSER ROGERS: When will that committee meet?

The CHAIRMAN: Some day next week.

Mr. DRESSER ROGERS: Possibly some clever gentlemen on the other side may get our bill referred to the same committee.

The CHAIRMAN: I am the only person who can take the initiative in that matter, and I shall take care to prevent any one else interfering.

Mr. DRESSER ROGERS: I should not press my motion to have the letter read, but I want the Board to see that I am only acting in the interests of my constituents. I believe the Board ought not to take any action in this matter without the approval of the Corporation. I am certain of this, that the more the Board inquire into the matter——(Order, order.) It is a matter of principle, and unquestionably the parties on the other side find that the Board are likely to be triumphant against them, and now they want to come to terms.

The motion was then put—"That the letter from the Board of Trade to the chairman of this Board, on the subject of the Metropolis Gas Companies Bill, be now read," and upon a show of hands it was negatived by 22 to 8.

Mr. DRESSER ROGERS called for a division, when there appeared—

For the motion	8
Against	27
Majority against	19

The motion was therefore lost.

THE CORPORATION OF LONDON AND THE GAS QUESTION.—At the next meeting of the Court of Common Council, the following report will be presented by the Gas Committee:—

Your committee and the Metropolitan Board of Works, acting in unison, introduced into Parliament the Metropolis Gas Companies Bill, as settled by the select committee of the House of Commons in 1875. The bill was read a first time, its second reading being fixed for the 9th of May.

Before we proceed with a statement explaining the present state of the gas question, we will answer that part of the order of the Court which directs us to report on the circumstances under which the alterations were made in the scheme for the amalgamation of the Chartered, Imperial, and Independent Gas Companies. The alterations made in the scheme in no way related to the City, except one, which extended the time for the directors to retire from three to four months.

We beg to remind the Court that the absolute power of consenting to any amalgamation scheme rests solely with the Board of Trade, and we may add that the scheme assented to does not confer any new powers on the companies.

Your committee appointed a sub-committee to act with a like committee appointed by the Metropolitan Board of Works. The joint committees met the agents for the companies at the Board of Trade, and after much discussion The Gaslight and Coke Company's bill was settled by the Board of Trade to the satisfaction of your committee and of the Metropolitan Board of Works. As so settled, it carries out the provisions of the Metropolis Gas Bill, approved by the Court on the 18th of November last, and which your committee were ordered to promote in Parliament this session, except that the amalgamation clauses in the Act of 1868 are not repealed.

The great advantage secured to the consumers of gas in the City by the bill, in addition to those secured by the Metropolis Gas Bill, is, that all future share capital, instead of being allocated amongst the shareholders, is to be raised in the following manner:—"Notwithstanding anything in this Act contained, the company shall, when any shares or stock created under the powers of this Act are to be issued, and before offering the same to the holder of any other shares or stock in the company, and whether the ordinary shares or ordinary stock of the company are or is not at a premium, offer the same for sale by public auction or by tender within the Metropolis, in such manner, at such times, and subject to such conditions of sale as the company shall from time to time determine, provided that at any such sale the reserved price put upon such shares or stock shall not be less than the nominal amount thereof; and notice of the amount of such reserved price shall be sent by the company in a sealed letter to the Board of Trade not less than 24 hours before the day of auction, or the last day for the reception of tenders, as the case may be; and such letters may be opened after such day of auction or last day for the reception of tenders, and not sooner. The intention to sell any such shares or stock by auction or by tender shall be communicated in writing to the town-clerk of the City of London, the clerk of the Metropolitan Board of Works, and to the secretary of the committee of the London Stock Exchange, at least 28 days before the day of auction, or the last day for the reception of tenders, as the case may be, and notice of such intention shall be duly advertised four times during the same period in two or more London daily newspapers. When any shares or stock created under the powers of this Act have been offered for sale by auction or by tender, and not sold, the same shall be offered at the reserve price put upon the same respectively for the purpose of sale by auction or tender to the holders of the ordinary shares or ordinary stock of the company, in manner provided by the Companies Clauses Act, 1863. Provided always, that any shares or stock so offered, and not accepted within the time prescribed by the said Act, shall again be offered for sale by public auction or by tender in the manner, and subject to the provisions of this Act with respect to the sale of shares and stock created under the powers of this Act. Any sum of money which shall arise from the issue of any such shares or stock by way of premium, after deducting therefrom the expenses of and incident to such issue, shall not be considered as profits of the company, but shall be expended in extending or improving the works of the company, or in paying off money borrowed or owing on mortgage by the company, and shall not be considered as part of the capital of the company entitled to dividend.

This plan has proved most successful in several towns where it has been tried, the capital being raised at very low rates of interest. Where this is done, the consumers of gas derive the advantage of the expenditure of £200 capital raised at 5 per cent. in the place of £100 issued at a £10 per cent. dividend, and the directors and shareholders have not any interest in the issuing of more capital than is required to carry on the company's works with advantage.

We feel bound to acknowledge the obligations which the consumers of gas in the Metropolis owe to the Board of Trade. Without that Board's assistance the labours of your committee last session could not have been brought to a successful issue, and this year it is owing to the pressure brought to bear on the companies by the Board of Trade refusing to sanction the amalgamation scheme, except on condition that the auction clauses were inserted in The Gaslight and Coke Company's bill, that the present success has been obtained.

It is necessary that the bill should be laid before the Standing Orders Committee of both Houses for their sanction of the amendments made in the bill. The Gaslight and Coke Company have entered into an agreement with the Board of Trade to prosecute the amended bill with all possible despatch, and the Board of Trade have power to call on the agent for the bill to withdraw it if any alterations are inserted without the consent of the Board of Trade. If from any cause whatever the amended bill should not become law in the present session, or be altered otherwise than as approved in writing by the Board of Trade, the company have engaged to offer no opposition to any bill introduced by Government to give effect to the provisions of the agreed bill.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

The Fourth Yearly Meeting of this Association was held on Thursday, the 27th of April, in the Temperance Institute, Greenock—Mr. W. DUNLOP, the President, occupying the chair.

The SECRETARY (Mr. James M'Gilchrist) read the minutes of the various meetings of the committee which have taken place since the last meeting of the Association at Stirling, and these, after some conversation, were adopted.

The auditors report was also read and approved.

The gentlemen whose names follow were then elected members of the Association—viz.: Messrs. Robert Clark, Bellshill; William Chalmers, Carluke; Robert Mitchell, Coatbridge; Hugh Walker, Ayr; Alexander Young, Clippens; James Dunn, Kilrush; John Fleming, Falkirk; and Peter Wilson, Stonehouse.

PRESIDENT'S ADDRESS.

The PRESIDENT delivered the following address:—

Gentlemen,—At the close of another season's labours, we have assembled for the interchange of opinion—for the diffusion of that knowledge which has come to us by experience—and to gather from each other such information as will be for the advancement of our profession, the perfection of which we so much desire, in order that, if possible, the defects which at present exist in our apparatus may, to some degree, be remedied, and that more improved appliances may be called into play; and further, that our defects and successes may be made known to each other, so that from these the timid and fearful may take courage, while the already prominent may, with increasing vigour, pursue their search into the hidden mysteries of nature which have so long lain undeveloped. The development of our branch of engineering has not kept pace with the advancement of other branches. There has been progress made in gas manufacture, as many facts show. Ingenious mechanical arrangements have been brought into use, which have lessened the expenditure, increased the revenues, and have given dividends to companies who, for years upon years, had their energies taxed to the utmost to make both ends meet; nor at the same time was this success so much due to ourselves as to others. It was the discovery and extraction of various chemical compounds contained in the tars, and the corresponding increase in their value, which, to a great extent, accomplished this end; so that while we have made progress, at the same time the fact still remains that there have not been the same decided substantial improvements in our branch as in others. It still holds true that we have fallen behind our friends in point of advancement. As a proof of this, take, for instance, the manufacture of paraffin oil. Its manufacture has developed with most extraordinary rapidity; so much so, indeed, that manufacturers are able, with success, to compete with the proprietors of oil wells. For another illustration of this, take the improvement made in our military equipments. Compare the comparatively recent with the present, and it is at once evident that in this branch there has been great progress. Then look at railways and bridges, and it needs no demonstration to show that in these branches there

has been a thorough revolution. But as for our branch no such thorough revolution has taken place. The coal is still thrown into the retort as before; lime is still the principal material for purification; the liquor is still, to a great extent, left unutilized; and the holders are, as a rule, of the same or kindred construction, so that gas manufacture is conducted nearly on the same old monstrous and expensive routine as it was 40 years ago.

But now that associations of gas managers are general—now that one manager does not look with suspicion on his neighbour manager—now that these prejudices have disappeared, and that mutual intercourse has been established—now that there is no more of that isolation and close-mindedness which so long characterized our profession, there seems to be a brighter future for us, more cheering prospects are now in view, and the time is surely close at hand when the existing state of matters shall have ceased to be, and when new and better things shall occupy their place. This (the advancement of gas manufacture) being the grand aim of our and like associations, it is for them and for us to exert ourselves to the very utmost, and strive to attain unto, and usher in, this brighter future, remembering that the sooner this is done the better will it be for us and for the world at large; therefore, let no one present hesitate to express his opinion, but take courage, and give utterance to his thoughts, that light may be shed upon the subjects for to-day's consideration. And may I express the hope that the discussions which may follow the reading of the various papers shall have the effect of awakening among us and others a more lively interest in the subjects, and that other and superior minds may take up the strain, and carry it onward and forward till it reaches perfection.

You will observe from the minutes of committee, that the interest manifested by them during the past year has not decreased in the very slightest degree, and that all matters that have come before them have had their careful consideration, you will also observe from the auditors report that the Association still continues to prosper financially; nevertheless, it is to be regretted that so many of the members are lax in the payment of their subscriptions. It is hoped they will be more punctual in the future.

The sub-committee appointed to investigate into Mr. Malam's process of gas manufacture, are extremely sorry to have to report that, after making a proposal in accordance with your remit from Stirling meeting, they have failed to secure a trial of that gentleman's apparatus. The correspondence connected with this matter appeared in the JOURNAL OF GAS LIGHTING of the 25th of January last.

It is now about four years since this process was first brought under our notice by the patentee, and it has furnished a fund for discussion at nearly all our meetings since that time, but at the present moment we are almost as wise upon the subject, and have now nearly as much information regarding it, as we had after it had been brought before us for the first time.

Somehow there has always been a lack of facts to show the real value and thorough practicability of this process; there has always been an apparent unwillingness on the part of the patentee to have his invention subjected to a sifting practical trial—a thing he ought to have hailed with pleasure, as thereby his interest might have been promoted.

A fair and candid test by our Association at his works would at once have settled the fact of its utility or non-utility, but, by refusing to give assent to this test, he himself, has been the means of raising doubts in our minds. If he were certain it would prove a success, and if he himself had found it to be so, then it would have enhanced the value of the patent, and strengthened the impression in our minds that it was an invention at once simple and profitable.

It was the fact of his unwillingness that led me to act as I did at our Stirling meeting, because, seeing that he was perfectly aware that his subject was to be discussed at that meeting, his absence on that occasion certainly induced me to fear that he had altogether abandoned the hope of having his patent adopted by the members of our Association. It has been affirmed that this process has been adopted in England and Ireland; if so, why is it that no returns have appeared before the public? How is it that this Association, which was the first to take up the subject, has not (even though it has often requested) received any reliable data wherein it can place perfect confidence? Wherefore is it that those who have adopted it seem so unwilling to make known their results? I think it is owing to one of two things; first, it must be either because the gain is so great as to be incredible, or, second, it is so small that it will not warrant them commending it to others.

But if their gains are so wonderfully great, then for their own sakes, and the interest of the patentee, they should have communicated the fact to that gentleman, and he to us, and so satisfied our desire for complete information, and by this time it might have been almost universally adopted. And if their profits are so small that it shamed them to mention the fact, then, in honour to themselves, truthfulness to Mr. Malam, and as a duty to the profession, they ought to have given the facts publicity, and by so doing would have set at rest the agitation and suspense they have caused in our minds; but, in not doing so, they have betrayed a trust to the patentee, the gas world, and ourselves, and thrown themselves open to the severest criticism. Surely these men, on whom so much depends, will come forth in their true colours, and give the long-desired and much-needed information, and so free themselves from the criticisms which they have so justly incurred.

It is, indeed, a pity that men will patent processes, and continue strenuously to uphold them, when for their support they have not a vestige of proof, when they have nothing whereby they can maintain their position except their own bold statements, and when these bear contradictions in their face. We cannot think contradictories; and it is, in my opinion, as impossible to conceive an increase of the heat of the retort, thereby increasing the yield, without correspondingly reducing the illuminating power, as it is to conceive a figure square and at the same time round.

From the difficulties which have arisen regarding this process, it must be evident that, if patents are to be properly tested, and if thorough investigations are to be made, we must have a standing committee, whose duty it will be to examine into and report on patent processes having regard to gas manufacture which may come under their notice. There are, no doubt, difficulties in the working of this system; but probably the chief one is, who is to pay the expenses? Certainly, the patentee; and for this reason—viz., he is receiving the benefit of the trial; for, by having it tested by our Standing Committee (whose sole duty shall be to test new processes), the patentee would have his improvement brought under the notice of the gas world, with a sure testimonial as to its market value.

And now, gentlemen, it only remains for me to apologize, or rather explain some of the remarks which I made on gas-exhausters at our last meeting at Stirling. I have no doubt that most of you will have noticed, from the pages of the JOURNAL OF GAS LIGHTING, the criticisms those remarks called forth, and the correspondence which followed thereon. I am quite ready to admit that those remarks of mine were rather indefinite and ambiguous, but I trust to be able to show you to-day why they were so. They were thrown out more as matters of personal opinion, and I hope, when once I have explained myself, you will not consider them groundless.

The reading of Mr. Young's paper, at our April meeting at Lanark, on the "New Process of Treating Gases during Condensation," interested me very much; and I took the liberty of calling upon that gentleman at the Clippens works, to make further inquiries on the subject. He not only gave me all the information I asked, but also handed over the use of his experimental apparatus to make the necessary experiments for my own satisfaction; only stipulating that any other information I might acquire, whilst making those experiments, should be kept strictly private. I made a good many experiments on various coals and shales, and was so satisfied with the results that I recommended my committee to erect similar apparatus in the Hamilton Corporation Works, and they, after fully considering the matter, agreed to do so; and, as I have no doubt most of you know, I have it now in operation, with results, so far as I have gone, quite up to my expectation.

During the time I was making those experiments at Clippens, Mr. Young was making researches on the influence of pressure on the destructive distillation of bituminous substances under varying pressures. Those experiments, being made beside me, interested me very much—more, perhaps, on account of my having made some practical experiments in the same direction some time previously, with the view of testing the influence of exhaustion on the yield and illuminating power of the gas, and the deposit of carbon in the retorts.

Mr. Young's apparatus consisted of two very strong cast-iron retorts, connected with a condensing arrangement, on the inlet and outlet of which were fixed valves for regulating the pressure under which it was desired to conduct the distillation. As his object was more particularly directed to the relative effects of pressure on carbonization and condensation, those valves were so placed that the pressure could be either kept on the retort alone, the condensation taking place under reduced pressure, or both retort and condenser kept under similar pressures. The results of those experiments, so far as they had gone when I penned the few remarks laid before you on exhaustion at our Stirling meeting, showed that the pressure on the coal during distillation did not affect the illuminating power of the gas so much as the condensation of the gases under similar pressures. Here was a different view altogether to take of exhaustion—one that had not hitherto received attention. Most gladly would I have laid this new view of exhaustion in very plain terms before you; but, seeing I was a privileged person at those experiments, and that I had promised I would not make public or any other use of what I saw, I was compelled to say nothing, or only use the language I did, and express my own opinions.

These experiments have now been so far completed, and along with the results of others covered by patent, and as I now have the liberty of the patentees to make use of the information acquired, I will, by-and-by, make up for any vagueness in my expressed opinions at our Stirling meeting.

The pressures under which those experiments were made ranged from ½ to 2½ atmospheres. The effects on the destructive distillation and condensation under those varying pressures were very various.

As a general rule, when the heats were high on the retorts, a comparatively small increase of pressure very much reduced the illuminating power, but rather increased the yield; on the other hand, when the heats on the retorts were medium or low, a very considerable increase of pressure had very little effect on the illuminating power; and, in some cases, with certain coal at low or medium heats, pressure slightly increased both the yield and illuminating power of gases.

The effects of pressure during the condensation of gases were very different from those of carbonization, for at whatever temperature the coal had been carbonized, an increase of pressure during condensation caused a lowering of the illuminating power of the gases, and *vice versâ*, a diminution of the pressure caused a very considerable increase in the illuminating power. This difference in the illuminating power ranged, under different circumstances, to the extent of from 2 to 30 per cent.

The general conclusion to be drawn from those experiments being—

A. That at very high heats, pressure on the coal being carbonized should be carefully avoided.

B. That at medium or low heats, pressure on charge has not an injurious action, but in many cases the opposite, tending to assist the heat in the decomposition of the coal into gaseous bodies.

C. That in all cases it is advantageous to relieve the pressure as much as possible during condensation, as thereby the illuminating power is much enhanced.

We all know that it is impracticable to make any considerable reduction of pressure on the coal carbonized inside the retorts; all we dare do (and what has hitherto been believed by many as all that was required) being to bring down the pressure to that of the atmosphere, or, in other other words, relieve the retorts of the working pressure; because if we go further, the air or products of combustion find their way through the pores of the retort amongst the gases produced from the coal. In my opinion it even becomes very questionable if it is desirable to bring down the pressure to within 4 or 5 inches of the surrounding atmosphere, as it is a fact that whenever the pressure comes below this, the law of the diffusion of gases comes powerfully into play, and although we may, by a further reduction of pressure, prevent a little leakage, yet we increase the infusion into the retort of the air or products of combustion to a much greater extent; indeed, I am satisfied that the lessening or the removal of the deposit of carbon by the use of an exhauster is, to a considerable extent, attributable to the air thus infused, and removing it in the form of carbonic oxide.

There is at least one thing of which I am perfectly satisfied, and that is, that the leakage through the pores of the retort, under the ordinary working pressure, is not anything like the amount of gain in volume said to be obtained by the use of an exhauster. We often hear of parties increasing their yield 10 per cent. by the use of an exhauster. Now, I have one of Mr. George Anderson's exhausters, and have made many trials with and without this exhauster, and I must say that, where similar heats were used, I never yet could say that I increased my yield 2 per cent., unless I allowed over-exhaustion on my retorts, when I both got quit of my carbon and increased my yield. Of course, I knew that my increased yield was coming from the furnace, and not from the coal in the retorts. I have tried, and I invite you to try, similar experiments, to test the amount of leakage through the pores of an ordinary fire-clay retort. Bore and attach a malleable iron pipe to a retort door, connect this with a small test gasholder filled with gas, and loaded to within a few tenths of your ordinary working pressure, only taking care that the seal in the hydraulic is not overcome, then allow the whole to stand till the gasholder is emptied, and note the time, and the results will at once prove to you how tight clay retorts are as ordinarily worked. Or another experiment. Take a piece of coal, say two pounds, and place it in the retort mouth, but sufficiently back to distil slowly. If you do this, some day when the retorts are laid off, you will hear the gas as it passes in bubbling through the water in the hydraulic for two or three hours, thus showing that two pounds of coal, say, under the circumstances, making only 8 cubic feet of gas, supply all the leakage taking place for three hours, and leave a surplus to bubble into the hydraulic.

Such are the results when the ordinary working pressure amounts to four or six inches and more; but the case is very different when the pressure is much lower. For, as you all know, should the retorts be left idle for some hours, and no pressure be exerted from gasses generating within them, they, on again being charged, show leakage; and in a similar manner, when the working pressure is removed, or nearly so, by the exhauster, the retorts also become leaky, and should the exhauster be stopped, the leaky condition of the retorts will be at once seen; but by allowing the pressure to remain on the retorts, they will become very soon, to all appearance, tight.

Now I think this can easily be explained in the following manner:—So long as the pressure inside the retorts exceeds four to six inches, the diffusive action of the gases through the porous septa of the clay retort is almost arrested, because the transpiration of the coal gases, produced by the pressure, overcomes this diffusive action, thereby causing the denser hydrocarbon vapours to pass in through the minute pores of the clay retort, where, undergoing decompo-

sition, the carbon of their constitution is deposited, and plugs the minute pores in the clay retort. And as the air is prevented, or nearly so, from being diffused into the retort by the pressure, the carbon is not burned out by the oxygen.

On the other hand, when there is very little or no pressure inside the retorts, the transpiration of the gases entirely ceases, and the law of diffusion comes powerfully into play, and for every volume of coal gas that passes outward through the walls of the retort, from one-half to one-third volume of air passes inward, and, of course, in its passage meets and combines with the escaping gases, or with the carbon deposited from them, and thus consumes them, and instead of the pores of the clay being plugged up with the deposited carbon, the retort is thus kept open and porous; and hence the reason why, when an exhauster is employed, the purified gases always contain a comparatively large volume of nitrogen, and also the reason why, when exhausters are suddenly thrown out of action, the retorts show such an amount of leakage. I think this also points out the true reason for the lessened deposit of carbon, it being simply burned or consumed by the infused air.

Now, although I deny that exhaustion, as ordinarily conducted, increases the yield of gas 10 per cent., or anything like it, or in other words prevents leakage to that extent, I do not wish it to be understood that I do not believe in the utility of removing the pressure on the coal during carbonization, as when high heats are employed I am satisfied that it is very important to relieve the pressure. Because, as proved by the experiments I have referred to, the richer hydrocarbons are more rapidly decomposed by high temperatures, when under pressure, than when rarefied and allowed to pass quickly from the retort. And not only is the rarefying action of the exhauster on the gases inside the retort of considerable advantage in preventing the over-decomposition of the hydrocarbons, but it also, as proved by the experiments already referred to, assists the gases in retaining those hydrocarbons in suspension, and thereby increases their illuminating power. Most of you, I have no doubt, will remember the experiments made by Mr. Young, with the volatile hydrocarbon, at our Lanark meeting; where he showed that equal volumes of gases, under whatever pressure, absorbed and held in suspension equal volumes of the vapours, and that by increasing or decreasing the volume of a given quantity of gas, by respectively relieving or increasing the pressure, their capacity to absorb the vapours of hydrocarbons were proportionately increased or decreased. You will also remember how he showed that the affinity of the gases and the tars for the hydrocarbons, so to speak, balanced each other. Keeping those facts in mind, we can easily see that relieving the pressure, during the condensation of gases, tends to increase their illuminating power. For by relieving the pressure we increase the volume of the gases, thereby increasing their capacity for absorbing hydrocarbon vapours. Those vapours they receive from the tars, and by being passed on and removed from the influence of the tars before the pressure is replaced, they are able to retain and hold those vapours permanently suspended through them. The amount of exhaustion, or in other words the extent to which we can relieve the pressure on the retorts, is limited from their porous nature; but such is not the case with the condensers, constructed as they are of an impervious material, and of sufficient strength to resist the pressure of the atmosphere. It is therefore evident that we may, to a much greater extent, take advantage of the rarefying action of the exhauster in enabling the gases to take up and retain the vapours of hydrocarbons, suspendable through them, and adding considerably to their illuminating power.

I dare say most of you who have read the correspondence in reference to the subject, in the JOURNAL OF GAS LIGHTING, will remember the flat denial given to the assertions I made, that barometric or atmospheric pressure affected the manufacture of illuminating gas quite as much, if not more than artificial exhaustion—*i.e.*, that the lowering of the barometrical pressure had quite as beneficial an effect on the production of gas as the lowering of the pressure by artificial exhaustion, and, consequently, works located at considerable elevations should produce a greater volume of gas with a higher illuminating power, or, in other words, a greater height of gas from a given coal than works at sea level, even with an exhauster. The benefits claimed for the lessening of the pressure by artificial means are—

1. That it prevents leakage through the porous walls of the clay retorts, and that there is consequently an increased yield of gas.
2. That the products of distillation are protected from over-decomposition by being rarefied or expanded, and that, as a consequence, the gas has a higher illuminating power.
3. There is a lessened deposit of carbon on the inside of the retorts.
4. The stand-pipes are not so liable to be choked with solid products, and I think I may now also, with equal fairness, say—
5. The suspension of an extra volume of vapours of the volatile illuminants ordinarily left in the tars.

Now, in my opinion, the experiments I have already referred to, go to show pretty clearly that there is no substantial gain in employing an exhauster to overcome the working pressure and prevent leakage through the porous clay retorts, yet of all the above list of benefits resulting from the use of an exhauster, this is the only one which does not equally result from a reduction of atmospheric pressure.

To illustrate my meaning, I will suppose a ton of Lesmahagow coal, carbonized at the following places, under a working pressure equal to a column of water 13 inches high, but under varying barometrical pressures due to their location as to altitude—viz., Glasgow at sea level, and having a mean barometrical pressure of 30 inches of mercury. Lanark between 700 and 800 feet above sea level having a mean barometrical pressure of 29 inches of mercury. Also Madrid and Mexico, being respectively located 1995 and 7471 feet above sea level, and having a mean barometrical pressure of 27·72 and 22·52 inches of mercury.

At Glasgow there would be produced, from a ton of Lesmahagow coal, 13,000 cubic feet of gas, and tars containing upwards of 2½ gallons of such a naphtha as this which I now hold in my hand. As you all know, this naphtha, or hydrocarbon fluid, is capable of volatilizing into a gas, and remaining permanently diffused through it. From experiments I have made, I find that such a gas as hydrogen can take, at ordinary temperatures, about 4 per cent. of its volume of the vapour of this hydrocarbon. Now, if during the distillation of the coal there had been added, at the proper time, hydrogen in sufficient quantity, the whole of this 2½ gallons of naphtha would have been converted into the gaseous state. This has been, over and over again, proved by what is known as the "hydrocarbon gas-making process." Were it by any means possible to expand the coal gases to a greater volume, they would themselves be able to take up and hold in diffusion the vapours of this naphtha.

If a ton of Lesmahagow coal was distilled at Lanark, at a similar temperature to that employed at Glasgow, there would be produced a similar quantity of permanent gas. But, as the pressure at Lanark is only equal to 29, instead of 30 inches of mercury, the volume would be expanded by about 448 cubic feet, and consequently there would be produced 13,448 cubic feet of gas. Now, this increased volume of gas would be able to take up an increased quantity of the vapours of the naphthas simultaneously produced, amounting to, as tested by experiments (were no other affinities brought into action), 4 per cent. of the increased volume. But, as shown us by Mr. Young at our Lanark meeting, the tars have an affinity for the naphtha vapours; and, therefore, I will suppose that the increased volume of gases only absorbed one-half of the found quantity, or 2 per cent. This would increase the volume of gases to 13,457 cubic feet, and their weight, calculated for the vapour density of this naphtha, by about 14,065 grains, or fully one grain per cubic foot. This weight of naphtha vapour I have found, when added to the gas from Lesmahagow coal, to increase its illuminating power about 0·80 of a candle; and, therefore, there would be at Lanark an increased sperm value of about 37 lbs.

Again, at Madrid and Mexico, under very much greater reductions of atmospheric pressure, the volume of the gases would be very much greater; and, consequently, the quantity of naphtha diffusible through their increased volume of gases would be much larger.

The following table gives the elevation of the several towns, the mean barometric pressure, and calculated results:—

Table of Comparative Results from One Ton of Lesmahagow Coal, under various Barometrical Pressures.

Name of Place.	Height above the Level of the Sea.	Mean Height of the Barometer.	Calculated Volume of Gases due to Mean Barometrical Pressure.	Increase of Volume.	Extra Weight of Hydrocarbon Vapours suspendible by reason of Increased Volume of Gases.	Calculated Total Increased Volume of Gas from Reduced Atmospheric Pressure and Suspended Hydrocarbon Vapours.	Increase in Sperm Value.
	Feet.	Inches of Mercury.	Cubic Feet.	Cubic Feet.	Grains.	Cubic Feet.	lbs.
Glasgow . .	..	30·00	13,000	..	..	..	..
Lanark . .	760	29·00	13,448	448	14,229	13,457	37·00
Madrid . .	1995	27·72	14,069	1069	31,527	14,089	86·82
Mexico . .	7471	22·52	17,318	4318	127,467	17,404	356·19

In a similar way, and for similar reasons, the over-decomposition of the products of distillation will be prevented by the reduction of atmospheric pressure; for, as the gases are stored in the gasholders under reduced pressures (in the case of Mexico, the mean pressure being only equal to 22·52 inches of mercury), the gases will be generated from the coal inside the retort under this pressure —*plus* the working pressure—equal to, say, another inch; making, in all, 23·52 inches of mercury. Before coal could be distilled under similar pressures at Glasgow, there would require to be produced a vacuum, or lowering of the pressure inside the retorts below that of the surrounding atmosphere equal to a column of mercury 6·48 inches high, or equal to a column of water 7 feet high.

Of course, we all know this to be impracticable from the nature of our retorts, and, consequently, with the most perfect exhauster, we cannot produce conditions so beneficial for the production of illuminating gas from coal as that produced naturally from the reduced atmospheric pressure due to the elevated location of a work.

Having now, in a very cursory manner, laid my view on exhaustion before you, I do hope that, by free discussion, you will express your opinions upon this subject. In the meantime, allow me to thank you for the patient hearing you have given to these remarks.

Mr. KEY took exception to some of the remarks in the president's address, which he thought were too personal. He further said the president did not believe the exhauster had any beneficial result in relieving the pressure from the retorts. For himself, he had noted, within the past few months, that, when the exhauster at his works was out of action, he lost 30s. worth of gas every hour.

Mr. YOUNG: I think it is scarcely fair to accuse the president of making this a personal matter, for it affects the Association. Certain remarks which he made at the Stirling meeting were taken up by outsiders in the JOURNAL OF GAS LIGHTING, and I consider that the president was bound to say something in justification of himself at this meeting. I do not think it is fair to exclude the president from explaining language used at that meeting.

Mr. M'EWEN: What is the weight of gas which appears to be taken from a ton of coal at Mexico, and are there tar and other matters as well as gas?

The PRESIDENT: This is a table based upon ascertained laws. I was not at Mexico to obtain actual figures, but I said such should be the case, and that there should be got an increased illuminating power, equal to 356 lbs. of sperm, out of the naphthas that are left in the tar from Lesmahagow coal.

Mr. M'EWEN: Is the effect of this pressure fact or theory?

The PRESIDENT: You may call it theory, if you wish; but the atmospheric pressure at the places named is an ascertained fact, although these figures may be open to criticism.

Mr. YOUNG: Having, along with the president, made a series of experiments on exhaustion in connexion with the new process, and in connexion with other improvements in the manufacture of gas, I shall perhaps be excused if I make a few remarks on the laws which regulate the diffusion of hydrocarbon vapours through gases. If we take a certain quantity—say a cubic foot—of gas, we shall find that it takes up a given number of grains of any volatile hydrocarbon brought in contact with it; if we then expand it to two cubic feet, it will take up double that quantity of vapours, for, under whatever tension the gases may be, equal volumes will take up equivalent quantities of the vapours of hydrocarbon. Now, it may be theory, so far as the president has reasoned out the question of the influence of artificial exhaustion on leakage through the pores of the clay retort; but his theory is founded on known facts. We know that, by adding a volume of hydrogen to any of the rich cannels during distillation, that volume of hydrogen takes up an equivalent portion of hydrocarbon vapours left in the tar, and forms with them an illuminating gas. This has been found over and over again in working the hydrocarbon process. Therefore, if hydrogen, added to a very rich coal, takes up an extra volume of hydrocarbon, and if the gases, when expanded, have an equivalent power in suspending naphtha vapours, it can be easily conceived that, under reduced atmospheric pressures, the volume of gases will be proportionately expanded, and consequently the results should be similar to those given in the table referred to.

Mr. M'EWEN: Do you add to that ton of coal the hydrogen? because if you do, you increase the bulk.

The PRESIDENT: There is nothing added to the coal. It is just the air being rarefied which allows the gas to expand to this increased volume.

Mr. YOUNG: Do you mean to add hydrogen to increase the volume? Such is not the case, and at Mexico such is not required, because there the permanent gases, or the 13,000 cubic feet which would be produced at Glasgow from the coal, would be expanded, as shown by the table, to 17,318 cubic feet. This extra volume would exactly act the part of 4000 odd cubic feet of hydrogen added to the gases at Glasgow, and as there is something like 2½ gallons of naphtha in the residuary tars, if these naphthas were presented to the expanded gas, that expanded gas would take them up and hold a considerable portion of them in diffusion as perfectly as is needed to convey them to the consumer, and that is all that is desired. There would be no extra weight of permanent gas, but there would be an extra weight of the diffused hydrocarbon vapours added to the gas, and that extra amount of vapour would give extra illuminating power equal to 336 lbs. of sperm. That should be, so far as ascertained facts would indicate, the result; but whether such would be the result would require to be found out at Mexico.

Mr. KEY: I think the chairman remarked that if we reduce the pressure by exhaustion at Glasgow, so as to relieve the weight of the atmosphere, to corre-

spond with the weight at Mexico, it would equal 6 inches of mercury, or 7 feet of water.

The PRESIDENT: I said that at Mexico we had less pressure by that amount.

Mr. KEY: You said if we worked the exhauster properly we should relieve the retorts to that amount.

The PRESIDENT: I never said such a thing.

Mr. YOUNG: What he said was this. That before he could get coal distilled in Glasgow under like conditions, he would require to relieve the pressure of the atmosphere equal to a column of mercury 6 inches high; but he said this was a physical impossibility, for the simple reason that the retorts were porous. And, therefore, were we to relieve the pressure to this extent, the air would rush into the retorts and mix with the gas, and you know what the result would be.

Mr. KEY: We have no reality but theory, and this theory about the presence of the atmosphere is wrong, because we are working with closed retorts from which the atmosphere is entirely excluded.

Mr. YOUNG: How are you able to bear 15 lbs. weight of atmosphere on every square inch of your body, amounting over the whole surface to many tons? Simply because there is an equal pressure from the inside. Inside a gasholder there is a pressure equal to that on the outside, *plus* the added weight of the gasholder. The gasholder is in direct communication with the inside of the retorts, and as the mean pressure on the gasholders at Glasgow is equal to 15 lbs. on the square inch, or equal to a column of mercury 30 inches high, and as that pressure must be pressing back into the retorts with an equal weight of 15 lbs. per square inch, *plus* the working pressure, it is evident that when working the exhauster at level gauge there would still be an equal pressure of 15 lbs. per square inch on the coal undergoing distillation inside the retorts. All that would be done by the exhausters would be to overcome the working pressures and lift the gasholder. At Mexico the case is different. There is a mean pressure of only 22 inches of mercury bearing down upon the gasholder, and consequently only 22, *plus* the working pressure, inside the retort. Now, if you are working under conditions where the mean pressure is only 22, as indicated at Mexico, instead of 30 inches as at Glasgow, the gases will be produced under a much lower pressure than they could possibly be produced by the use of an exhauster at Glasgow. And further, in a town such as Mexico, where the air is in a more rarified condition, the gases are stored and conveyed to the consumer in their expanded state, and consequently they are able to retain more of the hydrocarbon vapours in diffusion, whereas in Glasgow the gases, however much relieved by artifical exhaustion during their manufacture, must be stored and distributed under a much greater pressure, and so will have a lesser power of retaining hydrocarbon vapours in diffusion. Or, in other words, if 13,000 cubic feet, being the manufacture from a ton of Lesmahagow coal at Glasgow, take up a given volume of hydrocarbon vapours, 17,000 odd cubic feet, being the volume of the gas at Mexico, will take up an equivalently greater quantity of hydrocarbons, and that extra weight will be in the gas, and will add to its luminosity.

Mr. KEY: We are as well here as at Mexico, and it is a physical impossibility that we should be able to work our exhausters at a vaccum of seven feet of water.

Mr. YOUNG: I may as well again state that as in this country we are always working under a greater pressure than at Mexico, if it was possible, during the process of condensation, to keep our gases expanded to the same extent as at Mexico, from the lower atmospheric pressure there, when in contact with the tar, they would have, to a greater extent the power of holding on by the hydrocarbons produced along with them; so that if, during the process of condensation, we could by any simple means double the volume of the gases, we should double their power of holding on by the hydrocarbons suitable for carburetting a gas, and as we all know, if we take the tars and distil them, and pass the gases over the separate naphthas, we find that the gases have the power of taking up and holding in diffusion a considerable portion of those naphthas, thus clearly showing that the tars have a counteracting effect in preventing the diffusion of those vapours during the process of condensation; and, therefore, if we expand the gases during the condensation, we, so to speak, increase their power to overcome the counteracting absorptive action of the tars. Thus if, during the process of condensation, we can expand the gases to double their volume, convey them away from the tars in this expanded state, and afterwards allow them to shrink up, they would be able to hold on by nearly all the hydrocarbons which they had taken up from the tars whilst in an expanded state. It is a fact that by an inversion of the process—that is, by condensing the Lesmahagow gas under very considerable pressure, during the process of condensation—the illuminating power may be reduced to 13 candles, which, had they been condensed under the ordinary pressure, would have had an illuminating power of 30 candles. I may state further that there is a process being applied for the extraction of hydrocarbon vapours from shale and coals, by simply compressing them until the vapours separate. It can be easily understood that if we do the reverse of this, and expand them, we shall make gases hold an extra quantity of *hydrocarbon* vapours in diffusion.

The PRESIDENT: There can be no doubt that if Mr. Key lost 30s. per hour, his retorts must have been in a leaky condition on account of his working at level gauge.

Mr. KEY: I did not say a loss of 30s. by level gauge.

The PRESIDENT: When you were not using your exhausters, your retorts showed they were not in the condition in which they ought to be.

Mr. M'GILCHRIST: He said that when he was not working with his exhauster he lost 30s. per hour, while the president is of opinion that the thing can be done as well without an exhauster as with one. We must all tell our experience, in order to get at the truth; but we are indebted to Mr. Key for introducing this little bit of discussion on the president's paper, seeing it has elicited so many striking illustrations.

Mr. YOUNG: Before closing this discussion, I would like to make another remark. It is rather a wonderful thing that, if we reduce the pressure down to within two inches of the atmosphere, the law of diffusion appears to come so powerfully into play as to cause an effusion of gas and an infusion of air to such an extent that the gases meet, combine, and consume each other in the pores of the retort; and, although we look into the retort-oven, we see nothing coming through these pores, because it is met in its passage by the free oxygen and consumed; but still there is leakage from diffusion going on through the pores of the retort. If we heighten the pressure, the gas shows itself on the outside, for the simple reason that the law of transpiration coming into play causes the denser gases to pass in a relatively much greater quantity; but by keeping the higher pressure on the retorts for a little while, as we all know, they will soon become tight, because the denser hydrocarbons are decomposed as they are transferred through the pores of the retort, and the deposit of carbon closes up those pores, and the consequence is that we have a retort quite as tight, if not tighter, under considerable pressure, as the same retort would be kept at level gauge. And I know many country gas-works where they are taking out the full quantity of gas from the coals which they use, and where no exhauster is employed.

A vote of thanks was accorded to the president for his paper.

ELECTION OF OFFICE-BEARERS.

The following gentlemen were appointed office-bearers for the ensuing year:—Mr. Levi Monk, Lanark, president; Mr. George Niven, Airdrie, vice-president; Mr. M'Gilchrist, secretary; and Mr. Wm. Smith, treasurer. The committee appointed consist of the following gentlemen:—Mr. Fairweather, Mr. Young, Mr. Duncan Jeffrey, Mr. John Learmont, Mr. Wm. Dunlop, Mr. James Renfrew, and Mr. Carlow. Auditors, Mr. Hislop and Mr. Black.

Mr. W. SMITH (Newton Ayr) read the following paper:—

SIMULTANEOUS LIGHTING OF PUBLIC LAMPS.

The subject of this paper is one of very great interest to us all—namely, the simultaneous lighting of the public lamps by some automatic process. This being the first occasion on which I have had the opportunity of being present at a meeting of the Association, it is with diffidence that I submit a paper on a question with which so many of you are conversant. Since turning my attention to the subject of public lighting, I have examined the more recent volumes of the JOURNAL OF GAS LIGHTING, and find that within the last two years there have been a number of patents granted for appliances for the simultaneous lighting of our public lamps; but, to my mind, they have all one very great defect—a want of simplicity. Indeed, on reading the descriptions of them, one is forced to the conclusion that these appliances can never come into common use.

With the exception of one (and in that particular instance it is proposed to conduct compressed air by a separate system of pipes) they have all two things in common. The first is, that the variation of pressure is the motive power. This is the first and most available power that presents itself, and is also, as I consider, the best. It is at all times at our command; it is sufficient; it is certain in action; and it is at present available to all, without any alteration or expensive addition to our present plant.

The second thing they hold in common is, they have all two jets, one a small jet which is a constant flame, and the other the ordinary jet.

There is a great and, I believe, an insuperable objection to the constant flame, as being a continual source of loss, though, from the shorter time the lamps will be in full light, and the exercise of economy in other directions, the loss would not be so great as at first sight it appears to be.

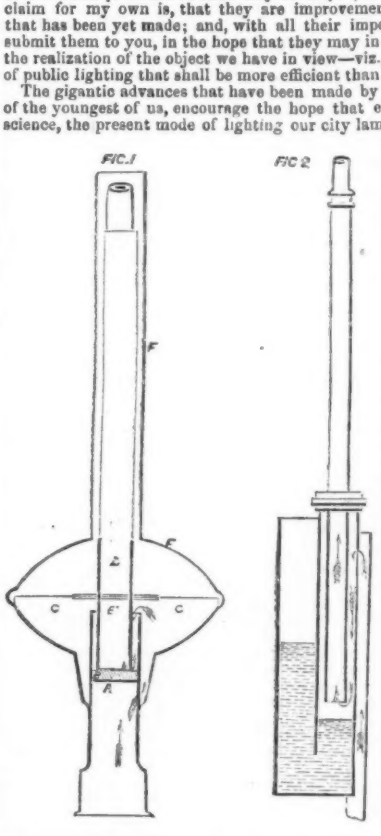
To obviate this, I do not see why electricity might not be made available to do all that necessitates there being any small jet. I am not sufficiently versed in electricity to say how this can be accomplished; but if we had an appliance sufficiently perfected to do the mechanical work, we should soon get that agent to complete the work.

As I intend this paper more as a whet to discussion, than to show all the arguments for and against the desired improvement, I need not mention all the defects connected with the present system. With these you are well acquainted. But I beg to remind you of a few of the more prominent of them. The waste of gas caused by the night pressure requiring to be put on, and some of the lamps being lighted sooner than required, suggests the thought to gas managers how to reduce this to a minimum. On the other hand, the inconvenience to the public of having some localities in darkness while others are lighted, is a continual source of complaint, and one that, under the present system, can only be remedied by additional outlay in material and labour.

The simultaneous lighting is a desideratum that we would all like to see supplied, if we could find some method, combining economy in its adoption and use with certainty of action; and such an appliance, to be successful, must be cheap, simple in construction, not liable to go out of order, and be easily made to suit any, and to work with very little variation of, pressure.

I have two appliances of my own invention to show you, but I do not claim for them all these qualifications; for, as some one has very aptly said, there is no invention produced at once fully developed, but that it grows. All that I claim for my own is, that they are improvements on anything of the kind that has been yet made; and, with all their imperfections, I now beg leave to submit them to you, in the hope that they may in some measure contribute to the realization of the object we have in view—viz., the perfecting of a system of public lighting that shall be more efficient than the one at present in use.

The gigantic advances that have been made by science, in the remembrance of the youngest of us, encourage the hope that ere long, through the help of science, the present mode of lighting our city lamps will be superseded by one that will bear some resemblance to the wizard-like operations of electricity.



I shall now, with your leave, Mr. President, describe as shortly as possible the drawings and models that I have the honour of placing before you.

In the annexed diagram, A, the inlet-pipe, the upper portion of which is formed into a small cup by a division at B, the gas flowing through the hole shown into the chamber C, the cover of which is a leather diaphragm, to which is fixed the burner tube, D, which, when the pressure increases, rises with the diaphragm, clear of a drop of mercury, in the small cup already mentioned. When the pressure is reduced, the flow of gas is at once stopped by the tube being sealed in the mercury. A constant jet can be supplied by having a small hole at E. F is a cover and tube that can be lifted off, and is only for protection; the tube being long enough to protect the small flame during the time the pressure is reduced, when it sinks down into it. Fig. 2 is on the same principle as an ordinary pressure gauge, and requires no explanation, as the arrows show plainly the passage of the gas, the action of the pressure being seen at a glance.

Mr. YOUNG: Personally, I have been greatly pleased with this device. The principle of it is not original, but the mechanical arrangement is so. I think, however, that Mr. Smith would require to enlarge the leather diaphragm, and lessen the weight of the jet socket, as at present it takes a pressure of two inches to throw it into action. The difficulty to the adoption of the arrangement, in my opinion, is that, when the pressure of the gas is just sufficient to keep the tube sealed by the liquid on a level with its surface, and no more, there would be a likelihood of a small quantity of the liquid bubbling up into the tube, which would keep the flame oscillating. If by any means he could so plan the instrument that the tube would be lifted instantaneously away from the surface of the liquid, I have no doubt that this defect would be entirely avoided. I am very much pleased with the invention.

(To be continued.)

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Quarterly Meeting of this Association was held on Thursday last, at the Bedford Hotel, Southampton Row, when there was a good attendance of members—the PRESIDENT (Mr. Wood) in the chair. The ordinary business was transacted, and three new members elected—viz., Mr. James Hunter, of the Woolwich Consumers Gas Company, Mr. W. R. Cooper, of the Banbury Gas Company, and Mr. Green, of the Mitcham Gas Company.

Mr. SCOTT, of Tunbridge Wells, read a paper on "The Setting and Working of Retorts," in which he dealt fully—First, with the material used for the construction of retorts; secondly, with their shape and size; thirdly, with the mode of setting; and, lastly, with the manner of working.

A discussion, which lasted nearly two hours, took place upon the reading of this paper, and, upon the motion of the president, a very cordial vote of thanks was given to Mr. Scott, the president in his usual practical style, remarking that the setting and working of retorts was, after all, a commercial question, and what the result was, with regard to the dividend, was the chief point for their attention.

The usual thanks to the president closed the proceedings.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The week just ended has brought no change of importance in the general state of the iron trade of this town and district. There was never a period at which the dulness was so supreme, or orders so difficult to obtain. In the manufactured iron departments, there is hardly any business doing, and even in the most favoured brands of pig iron the current transactions are on the lowest possible scale.

Some of the best Derbyshire pigs are a trifle higher in price, owing to the blast furnaces being either damped down or blown out for want of fuel. Quotations are, however, still within the boundaries of from 63s. to 68s., and are not by any means likely to rise above that limit, as both Scotch and good Lancashire pig iron could be bought, delivered here at a little less money. Virtually, however, there is no anxiety on this score, as the iron-works and foundries are very poorly off, and need but the smallest imaginable quantity of raw materials to keep them going.

The brass trade is pretty fairly engaged, for the most part in the execution of orders for plumbers fittings, and gas and water works requisites. The colliers of both the counties dealt with in these notes are still out on strike, and the main body appear fully determined to remain so, unless the coalowners give some indication of their intention to give way also on their part. So far, neither side, as a body, has shown the least sign of relenting, and there is unfortunately every likelihood of the dispute being greatly prolonged. At the Dronfield, Silkstone, Holnes, Low Ground, High Hazel, and Greasborough Collieries, the men have gone in at a reduction of 10 per cent., and are working thereat. There is indeed little doubt that, if the men were to approach the masters with a proposition to agree to 10 per cent. reduction, a settlement would at once be come to. The secretaries of the mens association are aware of this, and have just, for the third time since the dispute commenced, sent out circulars to the various district lodges, urging them to make the concession referred to.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The iron trade of this district, though stimulated to some extent by the revised quotations, still continues very dull, and much difficulty is experienced in keeping the works running half time even, while some of the works are altogether idle. The depression appears now to be shared equally by the makers of favourite brands, as by the producers of common unmarked iron. Unmarked bars are rather freely offered at £7 10s. per ton, and transactions are reported below that figure. Stocks are everywhere very low, and it is believed that the worst of the depression is now passed, though, for some descriptions of iron, the market is seriously affected by the severity of the Belgian competition, nail sheets being a notable example, sheets of Belgian manufacture being now delivered in Birmingham at £8 7s. 6d. per ton, the lowest quotations of local firms being £9 per ton for same quality of iron; from this cause, also, plates are relatively weaker than other classes of iron, and are pressed for sale at rates in favour of the buyer.

For pig iron the market is more severely depressed, and there are at present fewer furnaces at work than has been known during the past 40 years. The quotations for all-mine hot-air pig iron, made from South Staffordshire ores, are £4 5s. to £4 10s. per ton; cinder pig is quoted at £2 12s. 6d. per ton.

The demand for coal, though still quiet, is somewhat improved; manufacturing fuel continues in abundant supply, but rates are unaltered. There is at present no disposition on the part of the men to yield to the suggestion of the masters as to the increase in the hours of work from eight to nine per day; but coalowners seem to be agreed that the position of affairs will not be materially improved until the proposed change is made, the present mode of working adding greatly to the cost of fuel, in consequence of the plant and machinery of the various collieries being one-ninth less productive than formerly; and unless a decided change for the better should be soon experienced, it is not improbable that the masters will attempt to enforce the desired alteration.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is very little change to report either in the coal or iron trades of this district, and both branches are still characterized by extreme depression. The cold weather has helped to keep up a moderate inquiry for best coal for house fire purposes, and brick makers are now taking a considerable quantity of fuel suitable for their business, but otherwise there is very little demand for coal. The common classes, especially such as are used in ironmaking, are a drug, and, although the present low prices have compelled many of the colliery proprietors to close their seams altogether, supplies are still so abundant that sales are pushed at prices, in many cases, lower than those quoted for good descriptions of burgy, and it is difficult to obtain more than 7s. per ton for ordinary classes of common coal at the pit mouth. In other classes of fuel quotations remain without much change, Arley Mine coal at the pit mouth being quoted at 11s. to 12s. per ton; Pemberton four-feet, 9s. 6d. to 10s. 6d. per ton; burgy, 6s. to 6s. 6d.; and slack, 4s. to 5s. per ton. There is nothing fresh to report in gas coal; consumers are still making inquiries, but as no business of importance is expected to be done until the end of the month, colliery proprietors are not, as a rule, sending in their quotations, the difficulty being to ascertain how far the competition, which is expected, is likely to affect the prices which will have to be accepted to secure contracts.

The shipping trade continues very flat, and for what little business there is to be done there is a keen competition. The South Wales colliery proprietors are sending large quantities of coal into the Liverpool market at very low prices, and for ordinary Lancashire steam fuel, delivered at the high level, not more than about 7s. 6d. per ton can be obtained.

For coke there is still very little inquiry. Best Durham foundry cokes, delivered into the Manchester district, are quoted at about 22s. 6d., the local makes at about 20s. per ton.

There has been very little doing in the metal market during the past week. Any demand for pig iron is chiefly confined to the Bessemer and No. 3 foundry qualities, forge numbers being quite a drug. Quotations are little more than nominal, and may be given as under:—Lancashire, No. 3 foundry, delivered into the Manchester district, 60s.; No. 4 forge, 59s. per ton.; Middlesbrough, No. 3 foundry, 55s. 9d.; No. 4 foundry, 55s. 3d.; and No. 4 forge, 54s. 9d. per ton. For manufactured iron, the quotations for delivery into the Manchester district range about £7 5s. to £7 7s. 6d. for ordinary Lancashire bars; £7 10s. 6d. for Sheffield, and £7 12s. 6d. for Staffordshire. Rails are nominally the same as last week, but, as there is no real business doing, makers, as a rule, take just what prices they can get.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Large quantities of coals have been shipped from the Northern coal-ports recently. 100,000 tons of coals were shipped from the Tyne Dock the week before last, and about an equal quantity last week. The Northumberland steam coal trade keeps very firm. Turns, in many instances, are long, especially for the best qualities. Prices are steady, though there is no advance. The steam colliers are very well employed. There is less demand for household and gas coals. Gas coals were sold last week at from 7s. to 8s. 6d. per ton. The coasting demand has not been so great, but, as the Baltic business has opened out late this season, the inquiry for gas and steam coals for that sea has been well sustained. The outward Mediterranean market is clear of orders, and rates to Genoa and Alexandria are very low. The best customer that we have at present is France. Germany, Russia, and Austria seem to be very timid upon entering on trade this year, on account of the unsettled state of the Eastern question.

Steamers are taking a considerable quantity of coals to London, France, Hamburg, and the Dutch ports, and rates by steamer to London are about 4s. 6d. per ton. For fire-clay goods to Rochester by sailing vessels the freight is 8s. per ton. Only a limited quantity of fire-bricks, however, are being shipped to London from the Tyne at present.

The iron trade of the North of England gives no indication of a revival. The price of iron never was lower in the market, and manufacturers take only a gloomy view of the present state of affairs, as there is little appearance of an upward reaction.

The chemical business of the North of England has not been in such a depressed state since 1860. The market quotations of Saturday will show its position. Refined alkali, 2d., less 6½; soda ash, 1⅝d., less 3½; bleaching powder, £6 10s., less 10; bicarbonate of soda, £10, less 5; crystals of soda, £3 10s. nett. The market was very weak. Continental orders are coming in slowly.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The directors of the Langbank Gas Company, Limited, have resolved to reduce the price of gas 1s. 3d. per 1000 cubic feet, as from 1st ultimo, to private consumers, and 3s. 9d. per 1000 feet to the public lamps, the latter arrangement being made retrospective, so far as the past winter is concerned. Of late, the recognized price has been 8s. 9d. per 1000 cubic feet in both cases but against this high price there has to be set the fact that the gas has been of very high illuminating power—namely, 30 candles.

With the advent of summer weather, and there being comparatively little need for artificial illumination, the quality of Glasgow gas has begun to show signs of falling off. Dr. Wallace's official report for the week ending the 6th of May shows that in no case was the maximum illuminating power higher than 28·56 standard candles at any of the four stations, and in one instance it was down at 24·88 candles, which is below the statutory minimum. The sulphur per 100 cubic feet of gas ranged from 19·96 to 20·87 grains, at two of the stations where the gas was tested for that element, while the ammonia in like manner ranged from ·25 to ·43 grains per 100 cubic feet.

The Town Council of Campbeltown, a town that is famous all over the world for the quantity and quality of the whisky which is made in it, is promoting a Burgh and Harbour Bill, which is at present before a select committee of the House of Commons. The chairman is Colonel Loyd Lindsay, and the only opposition which the bill is receiving is from the Duke of Argyll, who is the superior over that part of Argyleshire. The bill aims at putting the supply of gas and water under the control of the Town Council. As to gas supply, the corporation seek to buy up the existing works of the private gas company, by which the town is at present supplied, and to supply gas themselves in the interests of the ratepayers. There seems to be no difficulty in reference to the gas question, no opposition being offered; but in reference to the water supply, there is a very strenuous opposition, the Duke of Argyle being desirous of keeping it in his own hands. Some very strong evidence has been given in favour of the promoters of the bill, and while I write these lines the case still continues before the select committee.

At the last meeting of the Paisley Water Commissioners it was recommended that certain water-pipes in the town should be increased in size. The provost said that he had received an application from a number of proprietors of public works in the northern part of the town for an increased water supply, and it had been stated by them that it was impossible for them to get on with their work for want of water. It was agreed to give the committee power to take estimates at once.

There has already been a long spell of dry weather in the west of Scotland, but even a week ago the directors of the Kilmarnock Water Company were showing some alarm regarding the short supply that was in prospect for the summer months. They issued a request to the public to be careful in the use of the water during the ensuing summer months, and to guard against waste and undue consumption.

Considerable progess is being made with the Clatto embankment and other portions of the water-works, which the Cupar Town Council have in course of construction. The whole of the main-pipes are now laid between Clatto and Cupar, and in the course of six or eight weeks the distributing-pipes will also be laid throughout the town.

The Local Authority of Dalry some time ago applied for a loan from the Public Works Loan Commissioners, under the Public Health (Scotland) Amendment Act, 1865, and in terms of that Act the loan had to be recommended by the Board of Supervision, Edinburgh. That board employed Mr. Thomas Stevenson, C.E., as their commissioner, to inquire into the nature of the works, &c., and on his report the board have intimated that they have recommended the application. They have accordingly recommended that the loan be spread over a period of 50 years, which is the longest term the Act allows.

Water or drainage schemes and extensions are under consideration at Newton St. Boswell's, Crieff, Peebles, Fraserburgh, Boddam (Peterhead), Arbroath, &c.

Business was done during the week in the Glasgow pig iron market up to 58s. per ton; but on Friday forenoon only one lot changed hands, the price being 57s. 7½d. At the close in the afternoon, buyers would not offer any more than 57s. 6d. cash. Several furnaces were damped down some days ago, on account of a wages difficulty with the furnacemen; but they are mostly in full operation again.

Coal becomes still slower of sale. There is no alteration of prices to notice.

BIRMINGHAM WATER SUPPLY.—Dr. Hill, the medical officer of health for Birmingham, reports that the water supplied to that town during April was "turbid with numerous particles and animalculæ," through imperfect filtration; the proportion of organic nitrogen, however, showed a decrease.

RICHMOND NEW WATER SUPPLY.—The Richmond Select Vestry have voted £2339 for the purchase of an old brewery, the site of the proposed artesian well, the water from which it is intended to pump up to a reservoir in Richmond Park, about to be constructed with the approval of Her Majesty's Office of Works.

THE FRAUDS UPON THE GREAT CENTRAL GAS COMPANY.—A paragraph appeared in the *Echo* of the 4th inst., stating that, according to private letters received from the Western States of America, Benjamin Higgs, who embezzled about £70,000 from the Great Central Gas Company in 1869, has just died from fever, and in the greatest destitution. When his defalcations were discovered he went off to Spain, and thence to America. On Wednesday last, in the Bankruptcy Court, London, an adjourned dividend sitting was held under an adjudication obtained against Higgs, and a resolution was passed that a dividend of 2s. in the pound be declared, a reservation being made in regard to claims which are still outstanding.

HULL GAS SUPPLY.—Mr. James Baynes reports that the gas sent into the district of Sculcoates and Myton during April by the British Gas Company averaged 16 candles illuminating power. It was at all times free from sulphuretted hydrogen and free ammonia. The results for the month are—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·34	15·50	16·00
Grains of sulphur per 100 feet	29·50	28·00	28·70

Mean barometer and temperature in experiment-room:—Bar., 29·90; tem., 57°. In the east district Mr. James Baynes, jun., reports that the gas supplied by the Sutton, Southcoates, and Drypool Gas Company during April possessed a fair illuminating power, the sulphur compounds were very low. The results for the month are—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·10	15·22	15·73
Grains of sulphur per 100 feet	—	—	6·25

Mean barometer and temperature in experiment-room:—Bar., 30·22; tem., 58°.

UCKFIELD GAS COMPANY.—The report of the directors of this company states that during the past year there has been a steady increase in the consumption of gas, the amount received from private consumers being £65 in excess of the previous year, also a considerable increase in receipts for coke and tar. The works which were in progress last year have now been completed, but the expenditure in executing them has been considerably in excess of the estimate given in last year's report. The directors, however, have the satisfaction of pointing out that the works are now in a very efficient condition, and equal to any demand for gas supply which may be made upon them for years to come. A district governor has also been fixed in the main, at the junction of Church Street, to equalize the pressure of gas in the High Street. The actual cost of the works has been £721, and to meet this outlay the directors have issued the remaining capital of the company, consisting of 50 shares of £5 each, at a premium of 30s. per share, realizing thereby £325, leaving a balance of £400 to be provided, which the directors suggest shall be raised on debentures, at 4 per cent. interest. Out of the balance of revenue account the directors propose to pay a dividend of 8 per cent., absorbing £160.

PUBLIC LIGHTING COMPLAINTS AT DOVER.—Referring to the complaints which were recently made in the Dover Town Council, upon the alleged defects in the public lamps, we learn that the number of casualties during 29 nights in the month of April amounted to 100. There are 558 public lamps, which, being multiplied by 29 (the number of nights) and divided into 100 (the number of casualties) shows that the casualties were less than 1 per cent.—viz., ·6. There were more casualties during the last month than usual, owing to changes of temperature, causing naphthaline to be formed in some of the lamps after they had been lighted some hours, and thus reducing the consumption of gas therein before they were extinguished in the morning. The lamp-cocks are always turned full on, and any defects discovered by the lamplighters, while lighting the lamps, or before eleven p.m., are attended to. This explains why the police reports refer only to hours at night, when the men from the gas-works are off duty. The public lamps are necessarily better supplied until eleven o'clock than afterwards. They consume more until that hour, and a little less afterwards, but, on the average, more than the contract quantity. The public wants are thus much better met than by a uniform quantity of gas being burned hour by hour, from sunset to sunrise. The Corporation of Dover are well protected against an excessively low pressure, on account of the peculiar position in which the company are placed. The Admiralty Pier and the railway stations are upwards of two miles from the gas-works, and at the lowest level of the district, and as the mail boats go out at eleven p.m., and come in between two and five o'clock every morning, if any deficiency in the supply of gas arose it would be immediately detected.

WATER POWER IN IRELAND.—At the meeting of the Institution of Civil Engineers of Ireland at Trinity College on the 3rd inst., a paper by Mr. James Andrews, C.E., on the supply of water to Cahercon Demesne, illustrating the advantageous application of the water power of Ireland, was read. It stated that much reference had been made in scientific treatises, papers, and reports, to the resources of mechanical power afforded by the rivers, streams, and lakes in Ireland; but, since the construction of the works on the river Bann, the increase of its development had not been very considerable, and several attempts which had been made had entirely failed. Water power exists under serious disadvantages. The supply of water is small in summer, when most wanted, and too large in winter; its existence may be at a distance too remote and in a place where it cannot be reached by the person who wishes to employ mechanical power; and if the manufacture of goods or the employment of power be established where the head of water is obtainable, the serious obstacles of the works doing injury to adjoining properties, the claims for consequential damages, the want of facilities of carriage, and there being no centres of population to supply workers, may lead to the stoppage and ruin of the concern. Considerations of this nature led to the construction of the works forming the subject of the paper. They were constructed in 1874 for Colonel the Hon. Charles White, under the agency of W. Lane Joynt, Esq., D.L., for the supply of water to his mansion and demesne, situate near the confluence of the rivers Fergus and Shannon, in the county of Clare. Two schemes were proposed, but the larger was carried out in 1874, after much consideration on the part both of Mr. Lane Joynt and the engineer, and is as follows:—There is a lake of 35½ acres in extent, and 39 feet of maximum depth, on the estate, and about three-quarters of a mile from Cahercon House; its elevation is 205 feet above Ordnance datum, and 165 feet above the ground-floor of Cahercon House. The natural drainage area is 314 acres, and a catchment drain was made, adding 126 acres, bringing the entire catchment up to 440 acres. Taking the rainfall at 30 inches, which is an under estimate, and three-fifths to be available, the annual yield will be about 30 million cubic feet. Storeage was obtained by tapping the lake five feet below its winter level, and by banking up the outlet to maintain that level, admitting 4½ millions of cubic feet capable of being drawn off in dry weather for the purposes of the scheme. The quantity of water that will be consumed will amount to 120 cubic feet per minute, so that the storeage will give a supply of ten hours per day for 60 days, or ten weeks, which with the natural run of the streams and springs is an ample provision against the severest drought. The supply being taken from the top of the lake at the nearest part to the house and offices, the intervening high ground for a distance of 450 yards, or over one quarter of a mile, had to be pierced, and as the slope towards the lake contained a deep floating bog, and the slope towards the house hard rock, the work presented considerable difficulty and cost. The levels of the summit of ground being favourable for a siphon, that means was originally proposed as being the simplest and least costly way of overcoming the difficulties; but it was thought necessary, in order to prove the question of cost, to make detail drawings also of the method of deep cutting, so as to take out the water direct at the lowest required level. Estimates from contractors were taken for both methods, all of whom preferred the siphon, which was executed at about £500 less cost than the other. An analysis by Dr. Cameron showed that the lake water is dark in colour, and did not appear agreeable for drinking purposes. To remedy this one defect there is a well 70 yards distant and 20 feet under the level of the ground-floor of the house, affording a small supply of pure water from a spring in the hard sandstone flags of the coal measures, and is sent into the house by a separate arrangement, distinct and in addition to the supply from the lake, which is used for water-closets, washing, slopping, &c.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

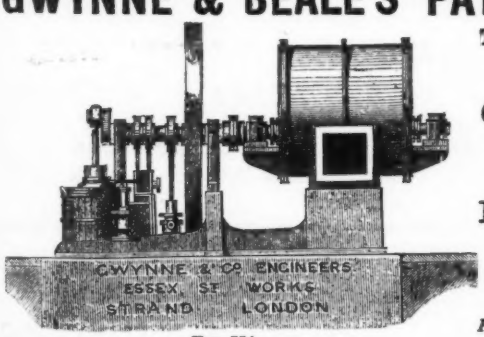


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

GWYNNE & CO.

HAVE MADE THE

LARGEST AND MOST PERFECT

EXHAUSTING MACHINERY

Ever produced, and the most economical in working.

Prices and every information on application.

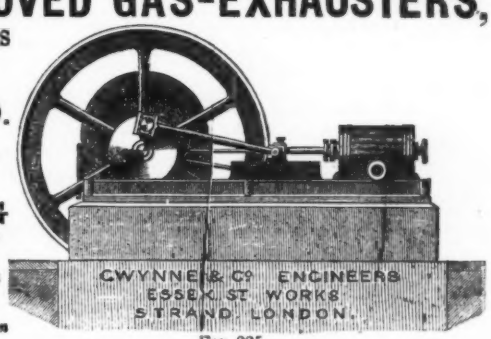


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the most perfect system of action yet discovered. Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the excellence of the article produced, and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS;

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S.E., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

WANTED, by a Ledger Clerk, many years in sole charge of the principal books in one of the largest gas establishments, and thoroughly acquainted with office business, similar OCCUPATION.

Address S. E. GOTTAM AND SON, Public Accountants, MANCHESTER.

WANTED, by the Advertiser, a situation as GAS-FITTER, Main and Service Layer, Meter Inspector, or to take charge of small works. Good references. Would have no objection to go abroad.

Address, G. K., 2A, George's Place East, Russell Street, BERMONDSEY, S.E.

FOR GAS-WORKS.

WANTED, an experienced Man, who understands working and fixing clay retorts, laying and testing mains, &c. Good wages. Cottage and garden.

Apply to Mr. A. WEBLEY, Manager, Gas-Works, Crawley, SUSSEX.

WANTED, a situation as Draughtsman to a gas company. Has had considerable experience. Can use the photometer. Good references.

Address, HYDROGEN, care of Mr. Griffiths, Duke Street, Little Britain, LONDON, E.C.

WANTED, by a thoroughly practical Man, a re-engagement as manager of a Gas or Gas and Water Works. He is well experienced in every department; keeping accounts, and carrying out extensions and alterations. Good testimonials and references.

Address No. 264, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a situation as Assistant MANAGER or INSPECTOR. Has had several years experience as Inspector in a London works; also four years in present country works as Assistant Manager. Understands thoroughly all branches connected with the distribution of gas. Good references.

Address, W. THOMAS, 3, St. Mary's Terrace, St. Mary's Square, PADDINGTON.

BARNET DISTRICT GAS & WATER COMPANY.

WANTED, by the above Company, an intelligent and steady young Man as CLERK.

Salary to commence at £50 per annum.

Applications, in candidate's own handwriting, stating age and other particulars, &c., to be forwarded immediately to Mr. T. H. Martin, Manager, Gas-Works, New Barnet, Herts.

By order,
ALFRED LASS, Secretary.

Offices, 60, Cornhill, London, April 28, 1876.

FOREMAN WANTED.

WANTED, a thoroughly experienced FOREMAN in a provincial Gas-Works, where the annual make is about 250 millions. He must be intimately acquainted with carbonizing, also have a good general knowledge of retort-setting.

Applications, in own handwriting, stating age, experience, wages required, and references, to be sent not later than the 1st of June, addressed to No. 263, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GENTLEMAN, thoroughly acquainted with the manufacture of gas, and at the same time a practical Engineer, desires an appointment as MANAGER of Works. No objection to the Colonies or Foreign Countries. Would be willing to manufacture and supply by contract, undertaking all office work, according to consumption.

Address GAS MANAGER, Messrs. Deacon's, Leadenhall Street, LONDON.

ADVANTAGES OF GAS FOR

COOKING AND HEATING.

HINTS ON GAS BURNERS, &c.

By MAGNUS OHREN, A.I.C.E., F.C.S.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works, Lower Sydenham, London, S.E.

GAS-WORKS FOR SALE, in one of the most rising seaport towns in Sweden, with the exclusive right of supplying the town with gas and gas-fittings during the remainder of the concession, now about 14 years. The town has the option, at the end of that term, of purchasing the works at a valuation, or renewing the concession for ten years. The price of gas, as limited by the concession, is 6s. 8d. per 1000 for public lamps, and 8s. 4d. per 1000 for private consumers. There is a ready sale for products at remunerative prices. Coals may be got from Newcastle at a lower freight than to London, and there are no coal dues.

For further particulars apply to Mr. RICHARD GLOVER, 214, St. John Street, CLERKENWELL.

TO TAR DISTILLERS, &c.

THE Directors of the New Gas Company, Limited, invite TENDERS for the surplus TAR produced at their works, Wormwood Scrubs, for One, Two, or Three years.

For particulars apply to the Manager, Mr. C. E. Botley, at the works.

Tenders to be sent in on or before the 25th day of May next, addressed to the Secretary of the Company.

The Directors do not bind themselves to accept the highest or any tender.

By order,
W. W. HASTINGS, Secretary.

22, Walbrook, E.C., May 12, 1876.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

J. T. B. PORTER & CO.,

GAS ENGINEERS,

MANUFACTURERS AND CONTRACTORS,

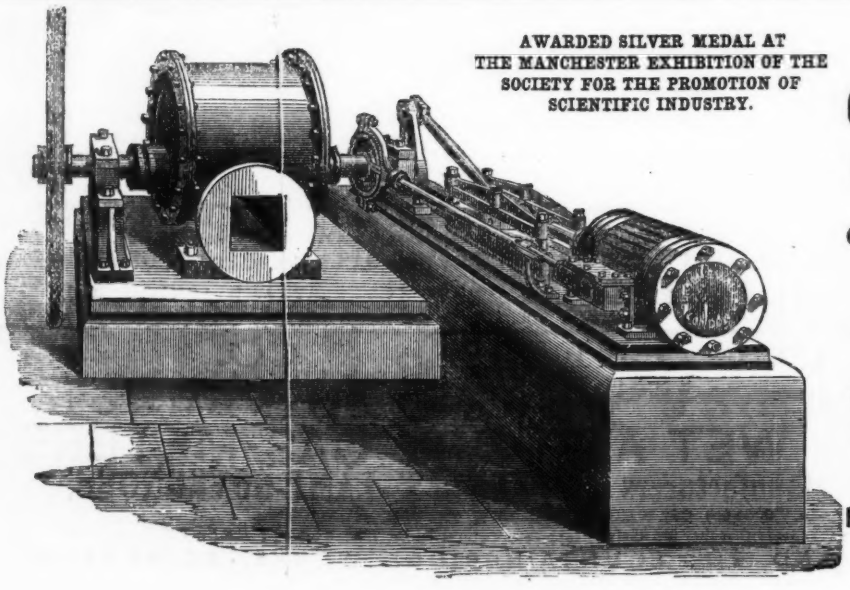
GOWTS BRIDGE WORKS,

LINCOLN.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—It is most particularly requested that all Communications be addressed to the FIRM ONLY, as circumstances have arisen which render this necessary.



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GAS-EXHAUSTERS

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BYE-PASS VALVES,
TAR, LIQUOR, and other PUMPS,
SCRUBBERS and PURIFIERS,
CONDENSERS, BOILERS, &c.

PHŒNIX ENGINEERING WORKS,
HOLLAND STREET, S.E.,
AND
STROUD, GLOUCESTERSHIRE.

GAS MANAGERS ASSOCIATIONS REPORTS.

WANTED, two each of 1863 and 1864 and one of 1867 of the British; and complete set from 1861 to 1874 inclusive. Also 1861 to 1869 inclusive, one of 1872 and 1873, of the North British.

Any person having any one or all to dispose of, please send price and address to L. MONK, Gas-Works, LANARK.

SITUATION WANTED as Manager, where the make is from 20 to 30 million cubic feet per annum. Eight years in last situation. Draughtsman and understands erection. Testimonials and references.

Address MANAGER, care of W. Brierley, 2, Bond Street, LEEDS.

BOROUGH OF LIVERPOOL.

ASSISTANT GAS INSPECTOR.

THE Council of the Borough of Liverpool are prepared to receive APPLICATIONS for the appointment of ASSISTANT GAS INSPECTOR. His duties will be to carry out any tests, either chemical or mechanical, for the quality and illuminating power of gas, to test gas-meters, and assist in performing any other duties imposed by law upon the gas inspector. Salary £200 per annum.

Applications, addressed to the Chairman of the Watch Committee, and endorsed "Assistant Gas Inspector," to be delivered at my Office not later than Friday, the 26th inst.

By order,
JOSEPH RAYNER, Town-Clerk.

Town-Clerk's Office, Liverpool, May 9, 1876.

TANK or Cistern (strong) Wanted, of wrought or cast iron, capable of containing not less than 120,000 gallons. State dimensions and price.

Address TANK, care of Robertson and Scott, Advertising Agents, 13, Hanover Street, EDINBURGH.

ON SALE—One Round Station-Meter, to pass 12,000 feet per hour, with 8-in hydraulic valves and bye-pass. Will be thoroughly overhauled and fitted with new drum. Also one 8-in. Anderson's Exhauster, with four driving pulleys, wall-box, &c.

Apply to J. AND J. BRADDOCK, Globe Meter-Works, OLDHAM.

FOR SALE, Nine Circular Mouthpieces, 18 in. diameter, 6-in. outlets. Also a few Lids and Connexions.

For price and particulars, apply to the MANAGER, Gas-Works, HOLMFIRTH.

FOR SALE—A second-hand Gasholder, in good condition, 33 ft. diameter and 9 ft. deep, with six columns, wheels, chains, and counterbalance-weights. Also some 5-in. and 4-in. Donkin valves.

Apply to Mr. W. T. HEWS, Gas-Works, HENLEY-ON-THAMES.

FOR SALE, equal to new, Two Sets of CONDENSERS; one Annular and one Vertical, with 120 feet of pipe. One double PURIFIER, 8 ft. by 5 ft. by 3 ft., and four-way valve. One GASHOLDER, 30 ft. by 12 ft. All 4-in. connexions. And a lot of New VALVES, 4 in. to 6 in.

Address, MANAGER, Gas-Works, Child's Hill, LONDON, N.W.

THE Swansea Gaslight Company have for immediate SALE, the following Plant:—

A 6-h.p. Patent Trunk Engine. (Beale.)
Cylindrical Egg-ended Boiler, 20 ft. by 4 ft. 6 in. (Beale.)
Exhauster to pass 15,000 feet per hour. (Beale.)
An 8-h.p. Grasshopper Engine. (Easton and Amos.)
Cylindrical Egg-ended Boiler, 20 ft. by 4 ft. 6 in. (Easton and Amos.)
Exhauster, 20,000 ft. per hour. (Beale.)
Tar, Liquor, and Water Pumps, Eccentrics, Shafting, and Driving Pulleys.
Wrought-iron Condenser, six vertical Legs, 30 ft. high, 24 in. by 6 in., with tar-boxes, dips, and syphons.
Wrought-iron Scrubber, 5 ft. diameter, 20 ft. high.
Cast-iron Scrubber, 3 ft. diameter, 20 ft. high.
A set of four cast-iron Purifiers, 12 ft. square by 5 ft. deep, with galvanized wrought-iron covers, lifting apparatus, four tiers of wooden sieves, 10-in. connexions and valves.

May be seen at the Gas-Works, Swansea. The whole in perfect working order; replaced by plant of larger dimensions.

Further particulars may be obtained on application to Mr. THORNTON ANDREWS, SWANSEA.

ALDERSHOT GAS AND WATER COMPANY.

THE Directors invite Tenders for the construction of a GASHOLDER-TANK of brick or concrete, 71 ft. 6 in. diameter; also for a single-lift GASHOLDER, 70 ft. diameter and 22 ft. deep, with columns, &c., complete.

Plans and specification can be seen, on and after the 11th of May, at the Office, Victoria Road, Aldershot.

Sealed tenders to be sent in not later than One p.m., on Wednesday, May 24, directed to the Chairman.

The Directors do not bind themselves to accept the lowest or any tender.

Information or particulars may be obtained by application to the Engineer, Mr. A. F. WILSON, at 34, St. George's Road, Southwark, LONDON, S.E.

TO GASHOLDER MAKERS.

THE Birkenhead Improvement Commissioners invite TENDERS for the construction of a Wrought-Iron ANNULAR TANK, 132 ft. diameter, and 31 ft. 6 in. deep.

Also for a Telescopic GASHOLDER, 130 ft. diameter and 60 ft. deep.

Plans and specifications may be seen on application to the Engineer, at the Gas-Works.

Tenders, addressed to the Chairman of the Gas and Water Committee, 50, Hamilton Square, Birkenhead, to be sent in on or before the 26th inst.

The tenders must be given in for Tank and Gasholder separately, and be marked on the envelope "Tender for Tank or Gasholder."

The Commissioners do not bind themselves to accept the lowest or any tender.

By order,
AMBROSE WALN, Clerk to the Commissioners.

Commissioners Offices, Birkenhead, May 11, 1876.

SOUTHWARK & VAUXHALL WATER COMPANY.

THE Directors of this Company are prepared to receive TENDERS for the supply of LABOUR, and use of Tools and Implements to be employed in removing, washing, and reinstating the filtering medium at their works at Battersea.

Specification and form of contract may be seen at the Company's Office, Sumner Street, Southwark, on and after Monday, the 15th inst., and sealed tenders, endorsed on the outside "Tender for Labour, &c., Battersea," and addressed to the Chairman, must be delivered before Ten a.m. on Thursday, the 18th inst.

The Directors do not bind themselves to accept the lowest or any tender.

ALFRED JELLEY, Secretary.

May 12, 1876.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Directors of the Blackburn Gaslight Company are prepared to receive TENDERS for the whole of the TAR and AMMONIACAL LIQUOR produced at their No. 1 and No. 2 stations for a term of One, Two, or Three years.

Sealed tenders, endorsed, to be addressed to Joseph Harrison, Esq., Chairman, and to be sent in on or before the 18th day of May next.

The Directors do not bind themselves to accept the highest or any tender.

Further information as to quality and quantity may be obtained of the undersigned.

By order,
SAMUEL R. OGDEN, Engineer and Manager.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

TAR AND LIQUOR CONTRACT.

THE Directors of the above Company are prepared to receive TENDERS for the TAR and AMMONIACAL LIQUOR produced at their works, at Wandsworth, during the next Twelve months. The Tar and Liquor to be removed by the Contractor, by barges, whenever required by the Company's Engineer. Monthly cash payments to be made.

The Directors do not bind themselves to accept the highest or any tender.

Tenders, marked "Tender for Tar, &c.," to be sent on or before the 22nd inst.

North Street, Wandsworth, May 10, 1876.

GLOSSOP GAS COMPANY.

THE Directors of the above Company invite TENDERS for 1383 lineal yards of 12-in., and 339 lineal yards of 18-in. Cast-Iron MAINS; also sundry connexions for same. All turned and bored joints.

The 12-in. pipes not to exceed 5½ cwt. each, and the 8-in. pipes not to exceed 3½ cwt. each.

The pipes must be cast vertically in dry sand moulds, delivered at Hadfield station of the Manchester, Sheffield, and Lincolnshire Railway Company.

Further particulars may be obtained on application to the undersigned, to whom tenders are to be sent, under seal, and endorsed "Tender for Mains," on or before the 20th inst.

The whole to be delivered by the end of July next.

By order,
THOS. HY. DANIEL, Engineer and Manager.

LLANELLY GAS-WORKS.

TO CONTRACTORS, BUILDERS, AND OTHERS.
CONTRACT No. 1.

THE Directors of the Llanelly Gaslight Company are prepared to receive TENDERS for the excavating and building of a Brick TANK, 92 ft. diameter and 25 ft. deep.

Drawings and specifications may be seen on application at the Gas-Works, Llanelly.

Sealed tenders to be sent in on or before Friday, May 19, addressed to the Chairman of the Gas Company, and endorsed "Tender for Tank."

The Company do not bind themselves to accept the lowest or any tender.

Further particulars may be obtained from the Engineer.

By order,
HENRY R. MARTIN, Engineer.

LLANELLY GAS-WORKS.

TO GASHOLDER MAKERS AND OTHERS.
CONTRACT No. 2.

THE Directors of the Llanelly Gaslight Company are prepared to receive TENDERS for the supplying, fixing, and completion of a GASHOLDER, 88 ft. diameter and 25 ft. deep, with all necessary guides, wheels, columns, and girders complete, to be erected at their Works, Llanelly.

Drawings and specifications may be seen on application at the Gas-Works, Llanelly.

Sealed tenders to be sent in on or before Friday, May 19, addressed to the Chairman of the Gas Company, and endorsed "Tender for Gasholder."

The Company do not bind themselves to accept the lowest or any tender.

Further particulars may be obtained from the Engineer.

By order,
HENRY R. MARTIN, Engineer.

TO CONTRACTORS, IRONFOUNDERS, & OTHERS.

TENDERS are required for the following WORKS, for Isaac Hoyle, Esq., and Another, at Summerseat, near Manchester.

CONTRACT No. 1.—The erection of the buildings of a new Gas-Work, consisting of a retort-house and chimney, coal-store, purifying and lime house, meter-house, governor-house, tar well, and two gasholder-tanks, &c., with all excavation.

CONTRACT No. 2.—The construction and erection of two Gasholders, each 40 ft. diameter and 16 ft. deep, with guide framing, &c., complete, and the iron roofs of the different buildings.

CONTRACT No. 3.—The supply and erection of the Iron Work of a retort-bench, condenser, scrubber, purifiers, &c.

The specifications and drawings may be seen at my Offices. Copies of the several specifications may be had on payment of one guinea each, and the amount will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, on forms to be had on application, to be sent to me, on or before the 1st of June, endorsed "Tender for Gas-Works," and the number of the contract.

The lowest or any tender not necessarily accepted.

T. NEWBIGGING, Gas and Consulting Engineer.

5, Norfolk Street, Manchester, May 12, 1876.

GAS AND WATER COMPANIES DIRECTORY.

THE EDITOR requests that the Forms sent to Secretaries and Engineers may be filled up and returned at once to 8, Buckingham Street, Adelphi, LONDON, W.C.

Price of Directory to Subscribers, 2s. 6d.

BY ORDER OF THE OFFICIAL LIQUIDATOR.

TO GAS COMPANIES, ENGINEERS, TOOL MAKERS, AND OTHERS.

THURGOOD AND DURHAM have received instructions from the Official Liquidator of the Air Gaslight Company, Limited, to SELL BY AUCTION, at the Rooms, 13, High Holborn, on Friday, May 19, at One o'clock, the APPARATUS, Machinery, Tools, Office Furniture, and other effects, the property of the above Company, including Generators, Blowers, Governors, Reservoirs, Gas Apparatus (one 30-light complete), a Lathe; also an Office Desk, Tables, Chairs, a large Deed Case, and numerous other items.

The Lots may be viewed the day preceding the sale, and catalogues obtained of Mr. J. H. THORNTON, the Official Liquidator, 15, FINSBURY PLACE SOUTH; of Mr. R. HEWLETT, Solicitor, 36, Essex Street, STRAND; or of the Auctioneers, Messrs. THURGOOD AND DURHAM, 123, Chancery Lane, LONDON, and Stony Stratford, BUCKS.

CONTRACT FOR COAL, &c.

THE Directors of the Preston Gas Com- pany are prepared to receive TENDERS for the supply of CANNEL, COAL, and Cannel Slack or Nuts, for the next One, Three, or Five years.

Tenders, endorsed "Tender for Coal, &c." and addressed to the Chairman of the Committee, must be delivered on or before Saturday, the 10th of June next.

Further particulars may be obtained from HENRY GREEN, Engineer.

Gas-Works, Preston, May 12, 1876.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR GAS COALS.

THE Directors are prepared to receive TENDERS for the supply of 6500 to 7000 tons of the best description of screened GAS COALS, for One or more years, as may be determined upon by the Directors.

The Coals to be as free as possible from sulphur, bats, bind, refuse, and dirt, and delivered free, by and at the expense of the Contractor, at the London and North-Western or Great Western Goods Station, Shrewsbury.

Tenders, specifying the Coals and the pits at which they are to be raised, must be delivered on or before the 1st day of June next.

The lowest or portion of any tender will not of necessity be accepted.

Payments monthly.

S. B. DARWIN, Secretary.

ENNISKILLEN GASLIGHT COMPANY.

TENDERS FOR COALS.

THE Directors of the Enniskillen Gas- light Company are desirous of receiving TENDERS for the delivery at Dundalk of about 900 Tons of Best GAS COAL, according to the times, or thereabouts, and the quantities, as mentioned in the following schedule:—

July	150 tons.
September	150 ,,
October	150 ,,
November	200 ,,
February	250 ,,

Cash payments, according to weight, as delivered at Dundalk.

Forms of tender, and any further particulars, to be had on application to Mr. GEORGE DUNBAR MALAM, Gas-Works, Bingley, YORKSHIRE, to whom tenders are to be sent not later than the end of the first week in June.

BOLTON CORPORATION—GAS DEPARTMENT.

CONTRACTS FOR CANNEL AND COAL.

THE Gas Committee are desirous of receiving TENDERS for CANNEL and best GAS COAL for the year commencing the 1st of July next, to be delivered free at the Bullfield or Craddock Lane sidings of the Lancashire and Yorkshire Railway, at Bolton, or if carted, at the Gas Street or Lum Street Works, as may be required.

Sealed tenders, endorsed "Tender for Coal," specifying the description of the Cannel or Coal, the pits at which they are to be raised, and the quantities proposed to be supplied, to be sent to the undersigned on or before Monday, the 29th inst., stating also cash terms for monthly payments.

The Committee do not bind themselves to accept the lowest or any Tender; but the person or persons whose Tende may be accepted will be required to execute an agreemen for the due performance thereof.

By order,
R. G. HINNELL, Town-Clerk.

Gas Offices, Bolton, May 5, 1876.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

THE Directors of this Company invite TENDERS for the supply of 2600 tons of GAS COALS of the following descriptions—viz., New Pelton, Felaw Main, or Wearmouth, to be delivered at the Company's works, on the southern bank of the Thames, in the parish of Egham, and outside the City coal dues boundary.

The Coals to be delivered as follows:—400 tons in each of the months of September, October, November, and December next; 300 tons in each of the two following months of January and February, and the remainder, as ordered, before the 1st of September, 1877.

The Directors invite tenders also for the supply of 200 tons of Cannel Coal, to be delivered as above, in quantities of 50 tons, in each of the months of October, November, December, and January next.

Tenders to state the price per ton for cash for the month's delivery, and for credit for three months.

The Directors will not accept any conditional tender, or be bound to accept the lowest or any tender.

The tenders to be forwarded to me on or before the 22nd of May instant, sealed and marked "Tender for Coals."

JOHN ANTHONY ENGALL, Secretary.

Staines, May 6, 1876.

TENDERS FOR GAS COALS.

THE Directors of the Bangor Water and Gas Company are prepared to receive TENDERS for the supply of the best Wigan or other best GAS COAL, in such quantities as may be required, either in One or Two years from the 1st of July next.

The probable quantity required in one year being about 1300 tons, or 2700 tons in two years.

The Coal may be tendered for as screened or unscreened, as the case may be, but must be fresh, and properly free from stones, pyrites, and all impurities.

Tenders must state if screened or unscreened be the coal, the particular name of the seam and locality from which the coals offered are to be supplied.

The Contractors will be bound to supply the coal strictly in accordance with an analysis, which must accompany each tender.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, stating price f.o.b. at Garston Docks, or delivered per railway at Bangor, must be delivered on or before the 1st of June next.

DAVID WHITE, Secretary and Manager.

CORPORATION OF ROTHERHAM.

GAS DEPARTMENT.—TO CONTRACTORS.

THE Corporation of Rotherham are prepared to receive TENDERS for the supply of the following ARTICLES:—

Contract No. 1.—Four Purifiers, each 20 ft. square, with connexions and centre-valve complete, and fixed.

Contract No. 2.—Of a Travelling Crane.

Contract No. 3.—Of a Gasholder Tank, 129 ft. by 20 ft. 9 in. deep.

Contract No. 4.—To supply and fix six Wrought-Iron Principals.

Contract No. 5.—To supply and fix Wood Work to an Iron Roof; also supply and fix Wood Work to a Lime Shed Roof.

Contract No. 6.—To supply and fix Slating to the above Roofing. The large, 63 ft. by 63. ft.; the small, 37 ft. by 15 ft.

Contract No. 7.—Labour only in building a new 63 ft. by 63 ft. Purifying-House.

Drawings and specifications may be seen at the Gas Offices, Rotherham, on application to Mr. James Goodwin, Manager.

Sealed tenders to be delivered to me not later than Twelve o'clock at noon, on Wednesday, the 17th day of May, 1876, endorsed "Tender for Gas Contract."

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
WM. WHITFIELD, Town-Clerk.

Town-Clerk's Office, Howard Street,
Rotherham, May 5, 1876.

Mr. ALFRED LASS,
60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

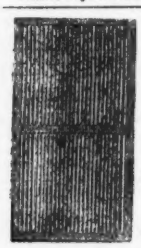
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

D. M. NELSON,
48, GORDON STREET (late 135, BUCHANAN ST.),
GLASGOW,

Supplies every requisite in connexion with the distribution of Gas and Water.

Estimates and prices on application.

WOOD GRIDS for Purifiers and Scrubbers.
Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.



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RENOWNED
WOOD SIEVES,
WITH TAPER BARS,
MADE BY MACHINERY
CAPABLE OF MAKING 10,000 FEET WEEKLY.
References to Hundreds of First-Class Engineers.
ROSE MOUNT IRON-WORKS
ELLAND, NEAR HALIFAX.

TO GAS COMPANIES.

GEORGE McKAIG,
MANUFACTURER OF
GAS-PURIFYING WOOD SIEVES,
153, CLEVELAND STREET,
DONCASTER.

It requires but one trial to prove the Superior Make, Strength, and Durability of these Sieves.

CARRIAGE PAID.

"SELLARS' CEMENT"

PREVENTS WASTE OF GAS FROM RETORTS;
SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;
GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;
And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

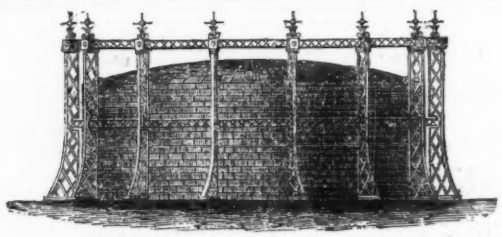
J. C. SELLARS,
THE GAS CEMENT WORKS,
BIRKENHEAD.

GEORGE ORME & CO.,
ATLAS METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
STATION-METERS, GOVERNORS,
PRESSURE AND EXHAUST REGISTERS,
LAMP-METERS IN CAST-IRON BOXES,
And every Description of Gas Apparatus.

B. GIBBONS, JUN.,
DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,
STOURBRIDGE (Established 1834),
MANUFACTURER OF EVERY DESCRIPTION OF
Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts,
A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
	18 in. × 15 in.,	20 in. × 16 in.,	22 in. × 14 in.,	24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.



THE HORSELEY COMPANY,
LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
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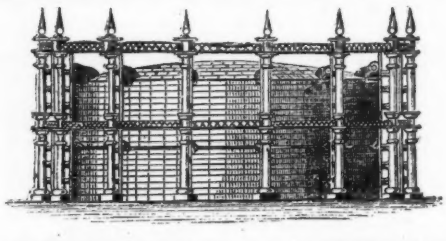
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,
GAS ENGINEERS & CONTRACTORS,
MANUFACTURERS OF GASHOLDERS,
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.

N.B—Estimates for all Gas Plant and Remodelling supplied on application.

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

CHURCH STREET,
MILLBANK STREET,
(NEAR THE HOUSES OF PARLIAMENT.) **LONDON, S.W.**

BUCCLEUCH ST. WORKS,
EDINBURGH.

As already intimated, we have, by the removal of our **LONDON WORKS** to the above address, secured not only a considerable extension of accommodation, but also the great advantage of a central position, and one easily accessible from all parts of the Metropolis.

We have now the pleasure of announcing that the extensions of our **EDINBURGH WORKS**, to which we also referred in our advertisement in the "Journal of Gas Lighting" of Feb. 15 (as being then in contemplation), are completed, and are already contributing to the more speedy and satisfactory execution of orders.

The additions to, and improvements of, our mechanical appliances for the accurate and expeditious production of the various parts of both wet and dry gas-meters, are such as probably do not exist, to the same extent, in any other gas-meter manufactory, either in this country or abroad.

It will afford us much pleasure to receive a call from any of our friends who may be interested in seeing our premises, either in London or Edinburgh, and the processes of manufacture.

The additions to our works, above referred to, not only give increased means of manufacture, but also enlarged accommodation and facilities for the repair, alteration, and adjustment of every description, and make, of wet and dry gas-meters; and we shall be glad to receive meters for repairs, &c., either in London or Edinburgh.

W. & B. COWAN,

(ESTABLISHED 1827,)

CHURCH STREET,
MILLBANK STREET,
(NEAR THE HOUSES OF PARLIAMENT.) **LONDON, S.W.**

BUCCLEUCH ST. WORKS,
EDINBURGH.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.

South Shields. W. J. WARNER.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

BIRTLEY IRON WORKS,

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DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

PLUTONIC CEMENT,

For Repairing Gas-Retorts in Action, preventing Porosity, and reducing the Deposit of Carbon, is highly commended.

WILLIAM RICHARDSON,

GAS AND HYDRAULIC ENGINEER,

CHARLES HENRY STREET AND BISSELL STREET, BIRMINGHAM.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.

WILLIAM FRASER,

INVERKEITHING,

Owner of the Works at which Fire-Clay Retorts were first made), can supply

RETORTS, FIRE-BRICKS, &c., to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

He ships at Charlestown his CELEBRATED HALBEATH STEAM COALS, on Navy List.

JAMES NEWTON & SONS.

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

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SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

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ANTI-CORROSIVE COMPOSITIONS. SZERELMEY IRON PAINT having been in use for upwards of twenty years, has stood the test of time. SIR CHARLES BARRY reported to the Chief Commissioner of Works (in 1859) that the Iron Roofs of the Westminster Palace, coated in 1856, "Still afford the most convincing and satisfactory evidence of its efficacy," and anyone who looks at the work now, in 1876, will see the same evidence.

THE Undersigned have, by means of extensive machinery and improved processes, succeeded in reducing the price of the Szerelmey Iron Paint, that which was formerly sold at £55 they now supply at £33, and make other kinds, commencing at £20 per ton, including Black, Purple, Chocolate, Red, Green, Blue, Bronze Green, Grey, White, and various tints.

THE Szerelmey Liquid Enamel, sold ready for use, is the cheapest Anti-Corrosive Composition ever produced; it dries in four hours.

SZERELMEY Stone Paint thoroughly waterproofs brick and other walls without giving them the appearance of having been painted.

COPIES of the Reports of Sir Charles Barry, Sir R. J. Murchison, and Professor Faraday (printed by order of the House of Commons), with twenty years of favourable testimony.

Price lists, discounts, and all particulars may be had of

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GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

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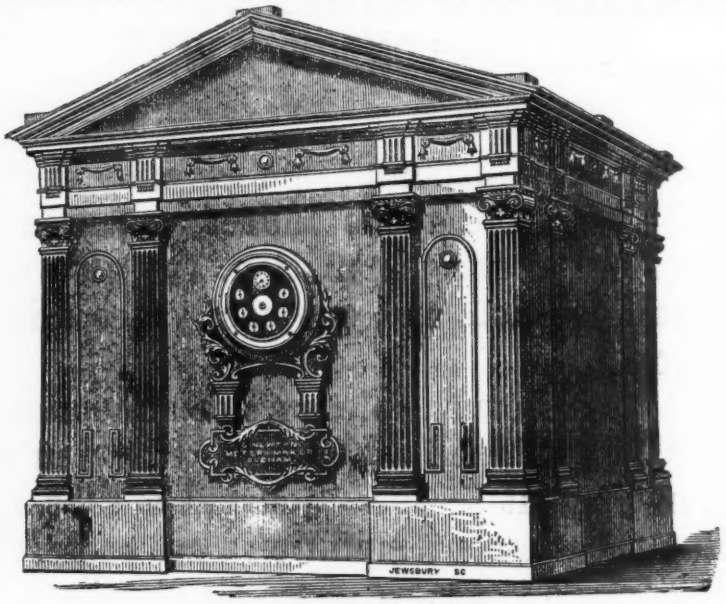

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SQUARE STATION-METERS, with PLANED JOINTS;

ROUND STATION-METERS, WITH CAST-IRON STANDS;

WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.

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CONTRACTING GAS ENGINEERS,

GASHOLDER & GENERAL GAS APPARATUS MAKERS,

MANUFACTURERS OF

BOILERS, IRON ROOFING, IRON BRIDGES,

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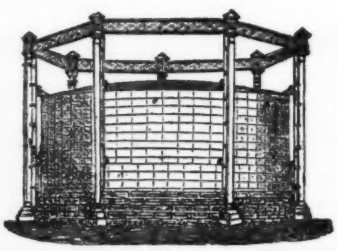

S. C. AND SONS undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works**, for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs**, and every description of **Apparatus** for the Manufacture and Distribution of Gas.

Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers**, and **Purifiers**, of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**

WORKS FOR THE SUPPLY OF

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S. C. AND SONS undertake the **Supply** and **Laying of Mains** for **Gas** and **Water**, and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of those goods most in request.

SOLE MAKERS OF BRETT'S PATENT COKE BARROW.

Experienced Retort Setters sent to any part of the Kingdom.

Address: **PROVIDENCE IRON-WORKS, MILLWALL, LONDON.**

KÖRTING BROS.,

Steam-Jet Engineers,

SOLE LICENSEES FOR

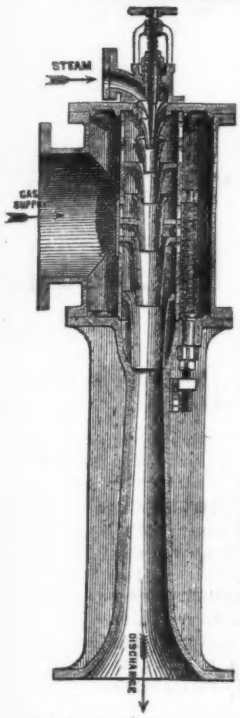
W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER,

AND

W. CLELAND'S PATENT STEAM SCRUBBER,

7 and 17, LANCASTER AVENUE,

MANCHESTER.



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France: 11, Rue Louis-le-Grand, Paris.
U. S.: 1645, N. 10th St., Philadelphia.

E. KÖRTING'S PATENT

STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—
Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—
No Extra Room Required—No Wear and Tear—No Noise—
No Oscillation in Vacuum, or Back Pressure.

UPWARDS OF 200 IN USE.

SUPPLIED TO—

Chartered Gas Co.	Horsham Gas Co.	Bury Gas-Works.
London Gas Co.	Epsom and Ewell Gas Co.	Glasgow Corporation.
S. Metropolitan Gas Co.	Ipswich Gas Co.	Leyland Gas Co.
Phœnix Gas Co.	Cheltenham Gas Co.	Stalybridge Gas-Works.
Liverpool Gas Co.	Sandwich Gas Co.	Lincoln Gas-Works.
Bolton Corporation.	Cornholme Dis.Gas-Wks.	&c., &c., &c.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

W. CLELAND'S PATENT STEAM SCRUBBER,
Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

FOR PARTICULARS, APPLY TO

KÖRTING BROS., 7 and 17, Lancaster Avenue, MANCHESTER,

OR TO

GERALD J. TUPP, 8, John Street, Adelphi, W.C., LONDON,

SOLE AGENT FOR ENGLAND AND WALES.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

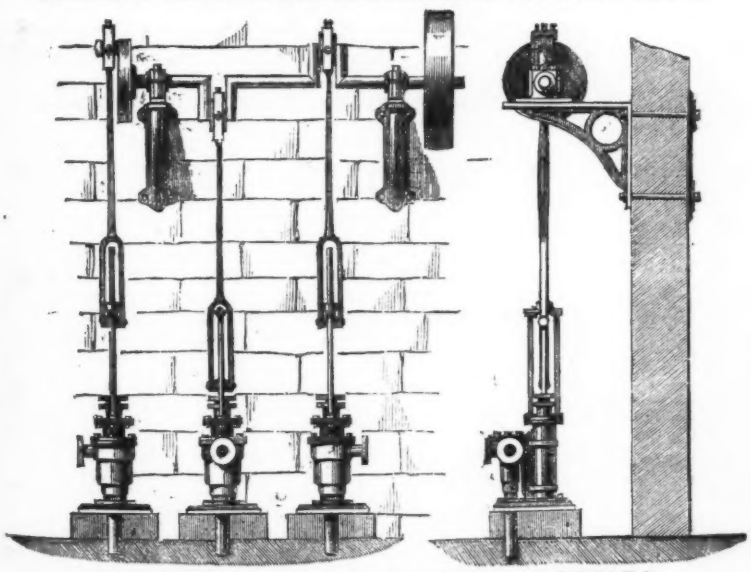
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.
For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

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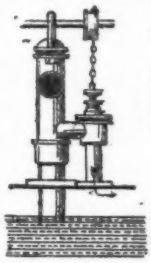

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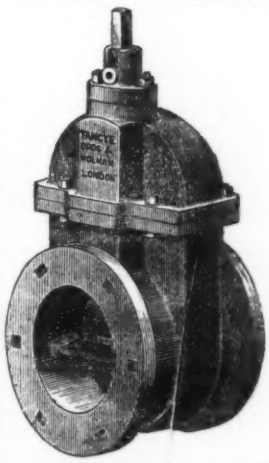

Inch.	s.	d.
3	25	0
4	36	0
5	40	0
6	54	0
7	63	0
8	80	0
9	85	0
10	100	0
12	120	0
14	140	0

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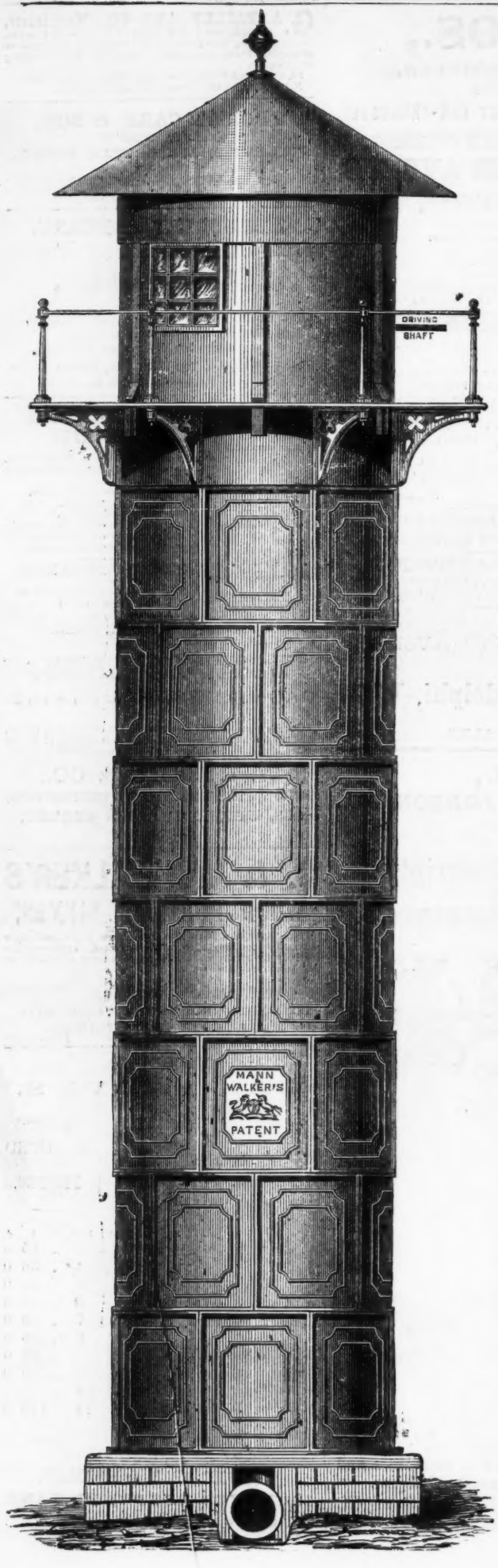

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MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

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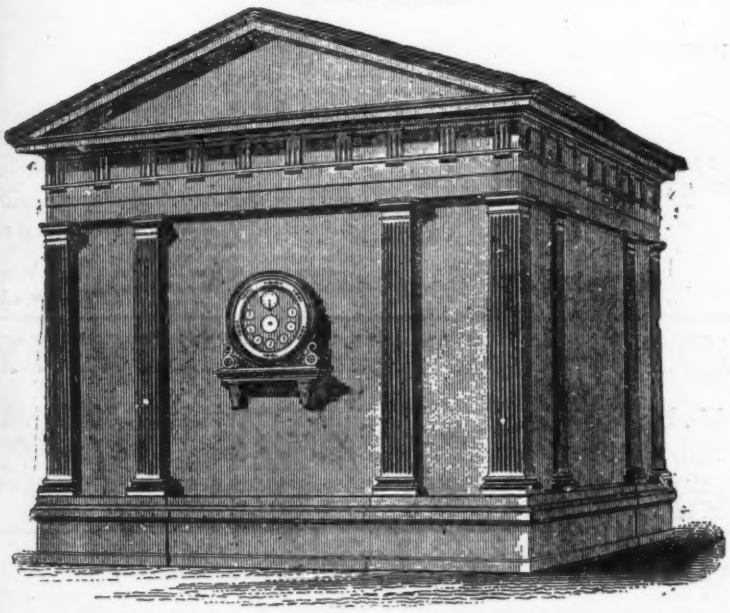

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Orders almost invariably despatched on the day of receipt.

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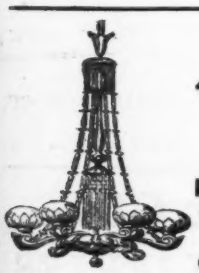

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PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

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FUEL-MACHINE, for Compressing Breeze and Tar.

WASHERS, SCRUBBERS, and PURIFIERS, that Economize Space and Cost.

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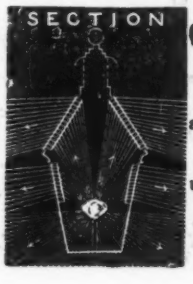

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Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL
Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Yields 13,320 cubic feet of 32·5-candle gas per ton.
Prices and full Analyses on application.

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Are prepared to supply their
SCREENED AND NUT GAS COALS.
This Coal yields 11,000 cubic feet of gas and 13½ cwts. of coke per ton.
Offices: ROYAL EXCHANGE, MIDDLESBROUGH.

HEBBURN MAIN GAS COALS.
Cubic feet of Gas yielded per ton . . . 10,050
Illuminating power in sperm candles . . 15·4
Yield of coke per ton of good quality . . 15¾ cwts.
THE TYNE COAL COMPANY, LIMITED, OWNERS.
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GAS COAL.
POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12¼ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars, apply to Pope and Pearson, Limited, West Riding and Silkstone Collieries, near Leeds.

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The Subscriber is prepared to contract for the supply of all the principal Scotch Cannel Coals. Prices and Analyses of the various Coals will be forwarded on application.
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Established 1840.

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Scotch Churls
PRESENT PRICE:
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Cubic Feet. 10,000 .. Illuminating Power. 20 candles. .. Coke (sup. qual.). 12 cwt.

CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, Flintshire.

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MAIN SEAM CANNEL COAL.
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Analysis and Price on Application.

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Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.
N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

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GAS COAL & CANNEL.
EMOR G. WRIGLEY
Has on hand a quantity ready for immediate delivery, and is prepared to contract for Supplies during the years 1876 and 1877.
Can strongly recommend his real OLD SILKSTONE GAS COAL, which will give, in regular work, 10,200 feet 16·6-candle gas, and 12 cwt. superior coke.
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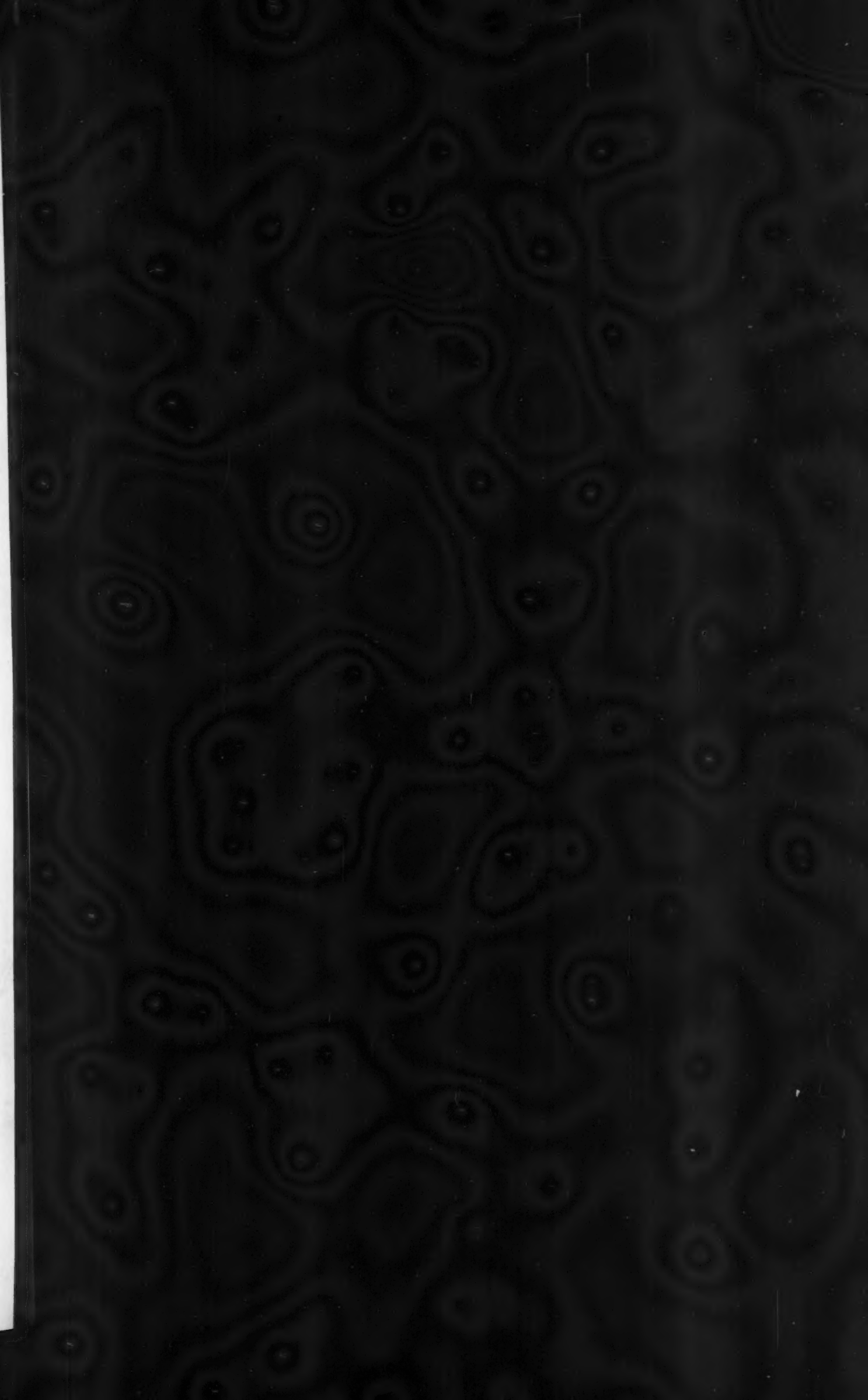
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.
Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—
(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

Note.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.
These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.
APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.



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By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

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JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, Magnus Ohren.

Size, 35½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.

No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,
Has all the appearance of a Bright Fire.
PRICE from 32s.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY,

LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	**10,775**
Weight of coke in lbs. per ton of coal	**1,465**

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE LOCHORE AND CAPLEDRAE CANNEL COAL

COMPANY, LIMITED.

Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: CUSTOM HOUSE CHAMBERS, LEITH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

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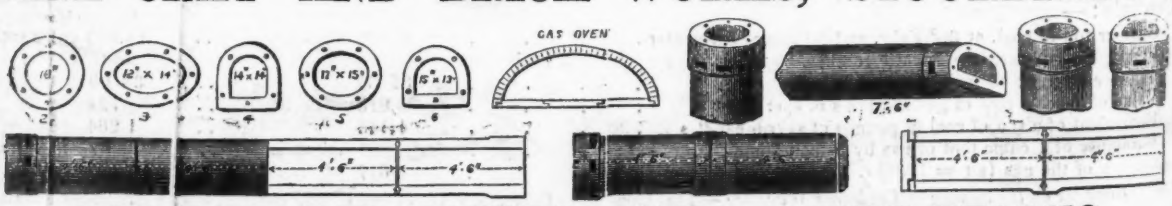

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